MOTOROLA

Remote Control Console

T120[illegible] Series

117 VOLTS 50/[illegible] CYCLE OPERATION

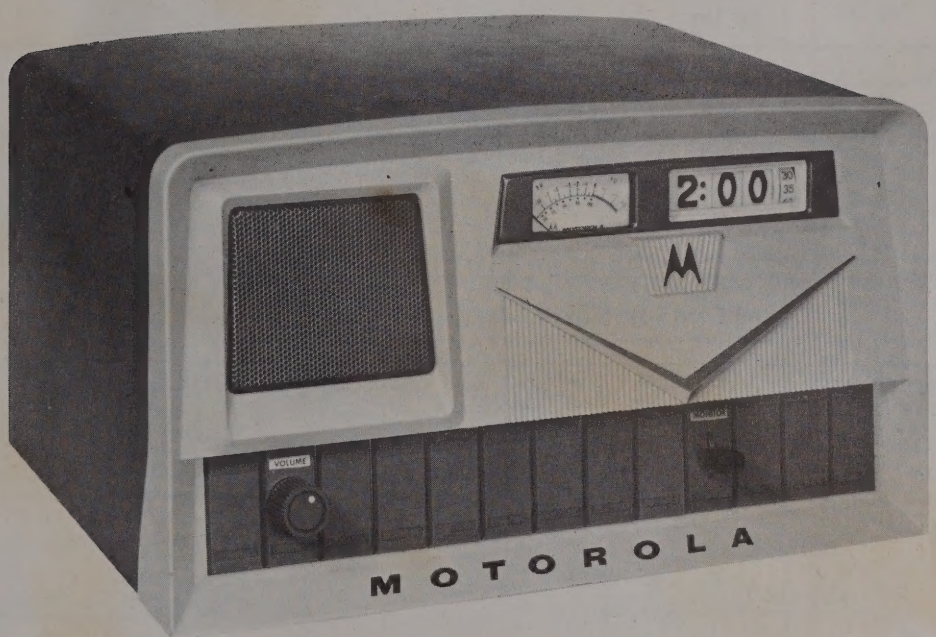
PRINTED IN U.S.A.

68P862180-D

REMOTE CONTROL CONSOLE

T1200A SERIES

CE-1333



Model T1204A
(Single-Frequency Console with
"Private-Line" Disabling)

MOTOROLA INC. COMMUNICATIONS DIVISION

Engineering Publications · *4501 W. Augusta Blvd.* · *Chicago 51, Illinois*

Copyright 1961 by Motorola, Inc.
Printed in U.S.A.
5/25/61-CP

68P862180
Issue - D

GUARANTEED PERFORMANCE SPECIFICATIONS

GENERAL

MODEL	T1200A Series
BASIC UNIT	TLN6017A Compression Line Amplifier and Power Supply
TUBE AND DIODE COMPLEMENT AND FUNCTION	2N651 - Microphone pre-amplifier 12AX7 - Voltage amplifier 6AQ5 - Audio Power amplifier (2) HD2149 - Compression rectifier (2) 2T1 - Compression stage diode
POWER INPUT	40 Watts at 117 volts a-c 50/60 cycles
DC CONTROL VOLTAGES	4 ma - 40 volts d-c 10 ma - 130 volts d-c maximum Maximum open circuit voltage 130 volts d-c
METERING	Standard vu meter, +8 vu reference level
WEIGHT	26 lbs
DIMENSIONS	Overall: 15-5/8" long x 12" wide x 8-11/16" high Chassis only: 13-3/8" long x 6-1/4" wide x 6-3/4" high

RECEIVE

INPUTS	600 ohm line (balanced)	Auxiliary Receiver (600 ohm unbalanced)
AUDIO INPUT LEVEL FOR BEGINNING OF COMPRESSION	Adjustable, MAXIMUM SENSITIVITY equals -20 dbm at 1000 cycles	+6 dbm at 1000 cycles:
FREQUENCY RESPONSE 300 cycles 3000 cycles (1000 cycle reference)	 -1 db (±2 db) 0 db (±2 db)	 +2 to +6 db 0 db
COMPRESSION	With audio input increase of 30 db beyond start of compression, output level increases less than 3 db	No Compression
SIGNAL TO NOISE RATIO	More than 45 db	
AUDIO OUTPUT	3 Watts maximum without compression with less than 3% distortion. (Reference 117 volts a-c input and 3.2 ohm load)	
TRANSFORMER LINE BALANCE	Better than 70 db	

TRANSMIT

INPUTS	LOW LEVEL MICROPHONE PRE-AMPLIFIER	HIGH LEVEL MICROPHONE	AUXILIARY ("QUIK-CALL" CONSOLE)
Audio Input	Low impedance dynamic microphones (Motorola Models TU532A and TU533A)	Low impedance dynamic microphone with built-in transistorized pre-amplifier	600 ohms unbalanced
SENSITIVITY FOR +10 DBM OUT (AT THE KNEE OF COMPRESSION)	.4 mv	-18 dbm	-4 dbm
Frequency Response 300 cycles 3000 cycles (1000 cycle reference)	+1 to -3 db ±2db	+1 to -3db ±2 db	+2 to +6 db ±2 db
Compression	With audio increase of 30 db beyond start of compression, output level increases less than 3 db.		No compression
Noise Hum Level	Less than -32 dbm		
Audio Output	18 dbm maximum, without compression, less than 3% distortion. (Reference 117 v a-c input and 600 ohms load)		

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

CONTROL FACILITIES

Built-In

Front Panel Mounted

VOLUME Control
Carrier indicator light

Chassis Mounted

MICROPHONE LEVEL
LINE INPUT LEVEL
LINE OUTPUT LEVEL
COMPRESSION BIAS

Optional

Front Panel Mounted

Two-frequency kit
"Private-Line" disable kit
Alert tone kit
A-C switch & pilot light kit
Supervisory switch kit
Push-to-talk kit
Intercom kit
Partial mute kit
Clock & VU Meter Kit

Chassis Mounted

Line equalizer kit
R-F indicator kit
"Dispatcher" Monitor Kit

FOREWORD

PURPOSE OF THE MANUAL

This manual offers the serviceman complete installation, operation, maintenance and service information on the MOTOROLA remote control console models contained in it.

The manual will serve not only as a ready reference for the experienced technician, but also as a step-by-step guide for inexperienced personnel.

All major section paragraph headings and diagrams are listed for the serviceman's use in the CONTENTS.

NOMENCLATURE

Each model in the remote control console series has a specific model nomenclature assigned. In all correspondence with MOTOROLA concerning the equipment refer to it by model number to insure correct identification.

A model chart is included in the front section of this manual. This chart lists the models covered by this manual and gives a summary of the items included in each model.

PRODUCTION CHANGES

When production and engineering changes are incorporated into the equipment, a revision numeral is assigned to the chassis or kit affected, e.g.; TLN6017A becomes TLN6017A-1 with the first revision. This model number complete with revision numeral is stamped on the chassis at the time of production. The revision numeral becomes an integral part of the chassis identifier.

A schematic diagram number complete with issue letter is also stamped on each chassis. This establishes direct correlation between the chassis and its schematic. The schematic issue is advanced each time a change occurs in the chassis. The applicable issue letter is stamped on the chassis.

INSTRUCTION MANUAL REVISION BULLETINS

Changes which occur after an instruction manual is printed are covered by the Instruction Manual Revision Bulletins. These bulletins give the reader complete information on the change including pertinent parts list data from which the instruction manual can be corrected.

NATIONAL SERVICE ORGANIZATION

Motorola is a nation-wide service organization. Through its maintenance and installation program Motorola makes available the finest service to those desiring reliable continuous communications on a contract basis.

The largest service organization specializing in mobile communications is Motorola's National Service Organization. Over 800 strategically located, adequately staffed and trained, independently owned and operated stations, manned with several thousand FCC Licensed Personnel constitute the sub-contracting force.

The administrative forces of area and district service managers and district service representatives are in the direct employ of Motorola.

For your contract service requirements, please contact your local Motorola representative or write to:

National Service Manager
Motorola Communications Division
4501 W. Augusta Blvd.
Chicago 51, Illinois

REPLACEMENT PARTS ORDERING

Motorola maintains parts and service depots in Fair Lawn, New Jersey; Dallas, Texas and Burlingame, California to supplement the activities of the Parts and Service Department in Chicago. The table outlines the services provided by these facilities:

Area Served	Parts and Service	Crystals
Central Area	Chicago Parts Dept.	Factory
Eastern Area	Fair Lawn	Factory
Southern Area	Dallas	Factory
Western Area	Burlingame	Factory

Factory:
Crystal Service Department,
916 N. Kilbourn Ave.
Chicago 51, Illinois

Burlingame:
Parts and Service
1616 Rollins Road,
Burlingame, California

Chicago:
Parts and Service
4910 West Flournoy St.
Chicago 44, Illinois

Fair Lawn:
Parts and Service
15-00 Pollitt Drive
Fair Lawn, New Jersey

Dallas:
Parts and Service
7138 Envoy Court
Dallas 35, Texas

These offices are fully equipped to give this service. When ordering replacement parts, the complete number identification of the item must be used whether it be a component, kit or complete chassis. This will fix proper identification and insure receipt of the desired item. Complete number identification should also be used when requesting equipment information.

Crystal orders should specify crystal type number, crystal frequency, carrier frequency and the chassis model number in which the crystal is to be used.

CAREFUL USE OF THE INSTRUCTION MANUAL AND THE MANY SUGGESTIONS CONTAINED IN IT WILL FURTHER INSURE PROPERLY INSTALLED AND MAINTAINED RADIO EQUIPMENT.

THE EQUIPMENT DESCRIBED IN THIS MANUAL IS MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING MOTOROLA U.S. PATENTS:

RE-24,110	2,566,759	2,699,425	2,799,001	2,883,521
RE-24,815	2,583,032	2,705,281	2,799,010	2.888,652
D-159,182	2,602,842	2,713,664	2,799,832	2,899,547
2,343,115	2,608,648	2,731,555	2,808,507	2,901,601
2,404,359	2,608,649	2,738,466	2,809,236	2,905,909
2,439,408	2,626,384	2,740,891	2,810,068	2,912,573
2,439,412	2,636,652	2,743,144	2,811,590	2,918,571
2,459,675	2,637,782	2,743,361	2,830,200	2,924,705
2,472,021	2,650,333	2,750,451	2,833,994	2,938,082
2,524,300	2,652,542	2,759,052	2,834,879	2,963,577
2,524,534	2,662,942	2,759,103	2,835,794	2,966,585
2,547,023	2,688,059	2,770,721	2,852,730	2,968,739
2,547,025	2,691,094	2,777,950	2,860,239	2,974,221
2,547,027	2,691,560	2,784,263	2,864,943	

Other U.S. Patents Pending

CONTENTS

SECTION	PAGE
Guaranteed Performance Specifications	ii
Model Chart	vii
DESCRIPTION	
Introduction	1
Application	1
Models Available	1
Description of Basic Chassis and Kits	2
Description of Optional Accessories	4
THEORY OF OPERATION	
Standard Reference Level	5
Use of the VU Meter	6
Amplifier and Power Supply	7
Transmitter Control	8
Receiver Control	8
COMMUNICATION LINE FACILITIES	
Speech Volume Level	9
Impedance	9
INSTALLATION PROCEDURE	
Inspection	10
Console Connections	10
Multiple Console Connections	11
Circuitry Modifications	11
PRE-OPERATIONAL ADJUSTMENTS	
Compression Bias	12
Line Output Level	12
Microphone Level	13
Line Input Level	14
Base Station Line Input Control Adjustment	14
Line Current Adjustment	15
OPERATING PROCEDURE	
Turning "On" the Equipment	15
To Receive	15
To Transmit	15
"Private-Line" Disabling	15
DIAGRAMS	
TLN6017A Parts Location Detail	16
TLN6017A Amplifier & Power Supply Chassis Typical External Connection Diagram	17
TLN6017A Amplifier & Power Supply Chassis Schematic Diagram and Parts List	19
T1200A and T1202A Intercabling Diagram and Parts List	21
T1201A and T1203A Intercabling Diagram and Parts List	23
T1204A Intercabling Diagram and Parts List	25
T1206A Intercabling Diagram and Parts List	27
T1207A Intercabling Diagram and Parts List	29
T1200A Series Audio Circuit Diagram	31
T1200A Series Control Circuit Diagram	33

MOTOROLA

MODEL CHART
FOR
T1200A SERIES
REMOTE CONTROL CONSOLES

CODE:

[X] = ONE ITEM INCLUDED.

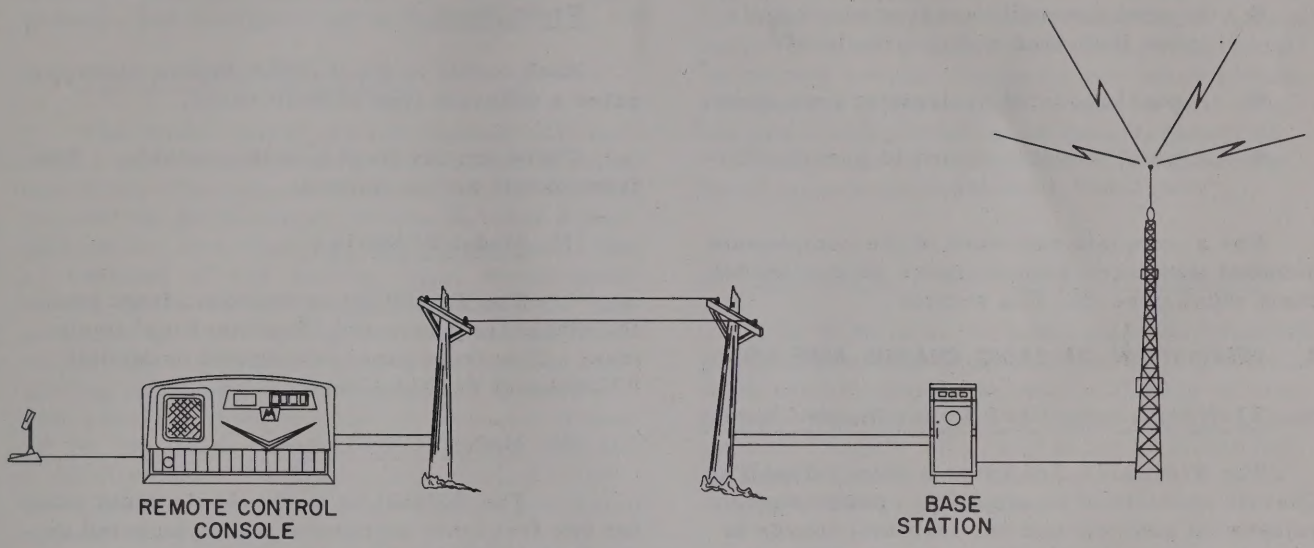
MODEL	DESCRIPTION	TLN6017A	THN6011A	TGN6010A	TGN6011A	TGN6004A	TGN6005A	TGN6006A	TGN6012A	TLN6169A
T1200A	SINGLE-FREQUENCY	X	X	X						
T1201A	TWO-FREQUENCY	X	X		X					
T1202A	SINGLE-FREQUENCY, WITH CLOCK AND VU METER	X	X			X				
T1203A	TWO-FREQUENCY, WITH CLOCK AND VU METER	X	X				X			
T1204A	SINGLE-FREQUENCY, WITH "PL" DISABLE SWITCH, CLOCK AND VU METER	X	X					X		
T1206A	TWO-FREQUENCY, WITH CLOCK (50 CYCLE) AND VU METER	X	X						X	
T1207A	SINGLE-FREQUENCY, WITH "PL" DISABLE SWITCH	X	X	X						X

ITEM	DESCRIPTION	REFERENCE DIAGRAM
TLN6017A	AMPLIFIER & POWER SUPPLY	63E862181
THN6011A	HOUSING	
TGN6010A	FRONT PANEL, SINGLE-FREQ., LESS CLOCK AND METER	63C862182
TGN6011A	FRONT PANEL, TWO-FREQ., LESS CLOCK AND METER	63C862183
TGN6004A	FRONT PANEL, SINGLE-FREQ., WITH CLOCK AND METER	63C862182
TGN6005A	FRONT PANEL, TWO-FREQ., WITH CLOCK AND METER	63C862183
TGN6006A	FRONT PANEL, WITH PL DISABLE SWITCH, CLOCK AND METER	63C862184
TGN6012A	FRONT PANEL, TWO-FREQ., WITH CLOCK (50 CYCLE) AND METER	63C862187
TLN6169A	PL RESISTOR KIT	

EPD-2149-A

DESCRIPTION

BEPD-4593-O



1. INTRODUCTION

The Model T1200A Series Remote Console provides all the control functions necessary to operate an FM two-way radio base or repeater station. All control facilities between the remote console and the controlled station are accomplished via audio/control lines. The console includes provisions for remote control operation of equipment using a one or two frequency transmitter and one or two receivers. All models except the T1206A operate from a 117 volt, 60 cycle power source. The Model T1206A operates from a 117 volt, 50 cycle power source.

2. APPLICATION

a. Remote Control Base Station Operation

When a base station is connected for remote control operation, the remote console provides the following functions:

(1) All messages received by the base station receiver(s) can be monitored at the console.

(2) The remote console operator can transmit by means of the base station transmitter.

b. Remote Control Repeater Operation

The T1200A Series Remote Control Console can be used in conjunction with various repeater systems. For proper installation and operation instructions, refer to the specific repeater instruction manuals.

3. MODELS AVAILABLE

There are seven remote control consoles available in the T1200A Series.

The T1200A, basic model, includes the following performance features:

- Balanced input and output line terminations.
- D-C control voltages for transmitter and receiver relay control.
- A panel mounted speaker.
- A compression type line amplifier which maintains essentially constant output over wide variations of input levels for both transmit and receive.

The other six models available include all of the features of the basic model, and may also include any of the following features depending upon the model desired.

- Receiver muting facilities which allow muting of the No. 2 receiver.

- A panel mounted transmitter frequency selector switch to permit frequency selection.
- A panel mounted vu meter which indicates both send and receive levels.
- A panel mounted cyclometer type clock.
- A panel mounted switch to permit "Private-Line" disabling.

For a complete summary of the components included with each model, refer to the model chart which precedes this section.

4. DESCRIPTION OF BASIC CHASSIS AND KITS

a. TLN6017A Amplifier & Power Supply Chassis

The TLN6017A Amplifier & Power Supply Chassis consists of an amplifier, power supply, adjustment controls and two terminal boards to provide termination facilities for specific operational functions.

The terminal boards are mounted on the amplifier chassis. Terminal Board, TB1, includes forty solder terminals. This terminal board interconnects the front panel to the amplifier & power supply chassis. Terminal board, TB2 has twenty-four screw terminals and is mounted in back of the chassis. All external connections are made to TB2. A number of blank terminals are available for operational functions which can be obtained by the use of accessory kits. A six prong microphone connector is mounted in back of the chassis. All adjustment controls on the chassis are slotted for screwdriver adjustment.

A summary of the adjustment controls on the TLN6017A chassis and their location is as follows:

MICROPHONE LEVEL - rear of chassis
LINE INPUT LEVEL - rear of chassis
LINE OUTPUT LEVEL - rear of chassis
COMPRESSION BIAS - top of chassis

b. THN6011A Housing

The Model THN6011A Housing is used for all T1200A Series Remote Control Console models. The housing is placed over the unit from the rear and covers the chassis and associated switching circuitry. The housing is of all-steel construction and finished in a dark gray enamel. The overall dimensions including the front panel of all models in the T1200A Series are 15-5/8 inches wide x 12 inches deep x 8-11/16 inches high.

c. Front Panel

Each model in the T1200A Series incorporates a different type of front panel.

There are six front panels available. The front panels are as follows:

(1) Model TGN6010A

The TGN6010A is the basic front panel for single frequency and "Private-Line" equipment. This front panel is mounted on Models T1200A and T1207A Consoles.

(2) Model TGN6011A

The TGN6011A is the basic front panel for two frequency equipment and is mounted on the Model T1201A Console.

(3) Model TGN6004A

The TGN6004A is a single-frequency control front panel which includes a clock and vu meter kit. The Model T1202A incorporates this front panel.

(4) Model TGN6005A

The TGN6005A is a two-frequency control front panel which includes a clock and vu meter kit. This front panel is mounted on the Model T1203A Console.

(5) Model TGN6006A

The TGN6006A is a single-frequency control front panel which includes a "Private-Line" disable switch, a clock, and a vu meter kit. These items are mounted on the Model T1204A Console.

(6) Model TGN6012A

The TGN6012A is a two-frequency control front panel which includes a 50 cycle clock and a vu meter kit and one double-pole double-throw frequency selector switch. This front panel is incorporated into the Model T1206A Console.

Each front panel basically consists of a speaker, a speaker VOLUME control, a transmit

indicator lamp and additional switch mounting facilities for various add-to kits. Provisions for mounting the clock and vu meter which are included with specific models, or ordered separately, are also provided on the panel.

d. TK551 Two-Frequency Kit

The Model TK551 Two-Frequency Kit includes a switch which permits selection of either one of two transmission frequencies and a switch to mute the #2 receiver. It also includes a potentiometer for line current adjustment. The kit consists of one locking type, double-pole double-throw switch (frequency selector), one non-locking type, spring return, double-pole single-throw switch (#2 receiver mute) and the cabling required for interconnection to the console chassis. Both of these switches are mounted on the front panel of the T1201A, and the T1203A models. This kit is also available for field installation on a console originally purchased without this feature.

e. TLN6051A Clock and VU Meter Kit

The Model TLN6051A Clock and VU Meter Kit consists of a clock, a vu meter, mounting brackets, resistors and cabling to provide interconnection to the amplifier & power supply chassis. These items are mounted on the front panel of the T1202A, T1203A and the T1204A models only. This kit is also available for field installation on consoles originally purchased without this feature.

The clock is of the cyclometer type, which operates on 117 volts, 60 cycles, a-c.

The vu (volume unit) meter provides a relative indication of either the speech level being impressed onto the telephone lines and the volume being received. It is supplied with two mounting brackets, and an attenuator and matching network to connect it into the output circuit of the amplifier.

This network adjusts the sensitivity of the meter, so that with the LINE OUTPUT LEVEL Control in its maximum position, the speech level will be +8 vu when the output is "leveled off" in compression.

f. TK553 "Private-Line" Disabling Kit

The TK553 "Private-Line" Disabling Kit permits disabling of the receiver squelch circuit in a remotely controlled FM "Private-Line" radio set. The kit consists of a non-locking type, spring return, double-pole, single-throw switch and cabling required for interconnection to the associated chassis. This switch is mounted on the front panels of the T1204A and T1207A Models only. This kit is also available for field installation on a console originally purchased without this feature. However, it cannot be used on a console which already has a two-frequency #2 receiver mute switch because both require the same console connections.

g. TLN6169A "Private-Line" Resistor Kit

The TLN6169A "Private-Line" Resistor Kit permits disabling of the receiver squelch circuit when used in conjunction with a TU533A Microphone. This kit is part of Model T1207A Remote Control Console only, and is not available for field installation on a console originally purchased without this feature.

h. Microphones

The microphone is an optional item and is not included as part of the T1200A Series remote control consoles. The type of microphones available for use with the console are as follows:

(1) TU532A Microphone

The Model TU532A is a desk stand dynamic microphone with a push-to-talk switch and a seven foot stranded cord terminating in a six prong connector. The microphone connects to the receptacle on the TLN6017A Amplifier & Power Supply Chassis.

(2) TU533A Microphone

The Model TU533A is a desk stand dynamic microphone with a push-to-talk switch, a seven foot stranded cord with a six prong connector, a cable with lug connections for "Private-Line" disable functions and a "Private-Line" disable switch. The microphone connects to the receptacle and the "Private-Line" disable cable connects to the terminal board on the TLN6017A Amplifier & Power Supply chassis. (The TLN6169A "Private-Line" Resistor Kit is also required when using the TU533A Microphone with the console.)

NOTE

Comprehensive instructions covering the individual microphone are supplied with the microphone.

5. DESCRIPTION OF OPTIONAL ACCESSORIES

The following accessory kits are available as optional add-to items for any of the T1200A Series Remote Control Console models. The kits are briefly described here to indicate availability and application. When an accessory kit is ordered, complete installation and operation instructions are included with the kit.

a. TLN6132A Alert Tone Kit

The TLN6132A Alert Tone Kit provides a 1000 cycle tone that can be used as a warning device prior to the actual voice transmission or as a test tone when adjusting the deviation of a transmitter. The kit consists of a transistorized oscillator, a switch, cabling required for circuit interconnections and facilities for mounting to the front panel.

b. TK555 A-C Switch & Pilot Light Kit

The Model TK555 Switch & Pilot Light Kit provides a visual indication when the a-c power is "on". This kit consists of a lamp, a rotary switch, a translucent plate and the cabling required for circuit interconnections. When the a-c power is turned "on" by means of the rotary switch, the lamp will glow and can be seen through the translucent plate. The switch and plate are mounted on the front panel.

c. TK556 Line Equalizer Kit

The Model TK556 Line Equalizer Kit compensates for high frequency line losses to maintain a flat frequency response. This equalizing takes place when the console is receiving a message. The kit consists of a parallel LC circuit and resistor network. Complete equalization (in both directions) can be accomplished with a second equalizer installed at the remotely controlled station. These kits should be used whenever the telephone line is of sufficient length to cause roll-off of the high frequencies in excess of approximately 10 db, i.e., when 2500-3000 cycles is more than 10 db down from 400-600 cycles.

d. TK557 Supervisory Switch Kit

The Model TK557 Supervisory Switch Kit provides supervisory control for a console over other consoles on the same control line. The kit consists of a three position switch, the required cabling for circuit interconnections, and facilities for mounting to the front panel. Supervision is accomplished by disabling the d-c control circuit or by disconnecting the other consoles from the control line.

e. TLN6148A R-F Indicator Kit

The Model TLN6148A R-F Indicator Kit operates the transmit light from the r-f field of the transmitter when used in conjunction with a Motorola Model P-8295-A R-F Probe. The kit consists of a squelch relay and cabling for circuit connections. The squelch relay kit is connected to the power supply & amplifier chassis. When the squelch relay is actuated, the transmitter "on" indicator lamp glows to indicate this condition.

f. TK559 Transmit Switch

The Model TK559 Transmit Switch permits operation of the push-to-talk relay in the console without operating the switch on the microphone. The kit consists of a front panel mounted switch and cabling for circuitry interconnections.

g. TLN6149A Intercom Kit

The Model TLN6149A Intercom Kit permits intercommuncation between remote control consoles on the same control line without actuation of the transmitter. The kit consists of a front panel mounted switch and cabling for circuit interconnections.

h. TK561 Partial Mute Kit

The Model TK561 Partial Mute Kit permits the receiver audio level to be reduced by a predetermined amount. In some installations complete muting of the signal is not desirable. For that application, the audio level is reduced a specific amount by means of an adjustable resistor connected in series with the local speaker audio line.

i. TLN6018A "Dispatcher" Monitor Kit

The TLN6018A "Dispatcher" Monitor Kit permits a licensed operator at the remote control console to monitor both the incoming and outgoing conversation of another person using that base station equipment from a point other than at the console.

The kit consists of a relay, mounting bracket, and the cabling for circuit interconnections.

THEORY OF OPERATION

6. STANDARD REFERENCE LEVEL

a. General Considerations

The common terms which are used to express audio power levels in a communication system are "dbm" and "vu". Another term which is often misused in this connection is the "db". It is important that the correct term, or unit of measurement, be used as determined by its application.

In a two-way radio communication system, the audio levels between various radio installations and control points must be adjusted for the specific applications to assure optimum performance.

When adjusting audio levels, it must be remembered that speech is a complex non-periodic wave form which is difficult to measure. The fluctuations, the damping characteristics of the meter, and the technique of reading the meter will all influence the final values of the audio level settings. It is the purpose of this explanation to provide the service man with a good understanding of the reference level terms which will be used in making the adjustments described in the PRE-OPERATIONAL ADJUSTMENTS section of this manual.

b. DB (Decibel) - Power or Voltage Ratio

The decibel (db) is a ratio and is defined as a unit of measure such that:

$$\text{db (power)} = 10 \log \frac{P_A}{P_B} \text{ or}$$

$$\text{db (voltage)} = 20 \log \frac{E_A}{E_B}$$

where P_A and P_B are two values of power, or E_A and E_B are two values of voltage. Note that since db is a ratio, it has no unit value such as volts, amps, or watts. Be careful not to use this term in referring to a specific audio level as has been the practice in some instances.

c. DBM - Decibel Referred to 1 Milliwatt

DBM is a symbol indicating a power level with respect to 1 milliwatt. It shows the number of db (ratio) above or below 1 milliwatt. Zero dbm is equal to 1 milliwatt. Although this definition does not necessarily imply 600 ohm impedance, most a-c voltmeters are calibrated in terms of dbm across 600 ohms. In this case, using the formula $P = \frac{E^2}{R}$ we get:

$$.001 \text{ watt} = \frac{E^2}{600} \text{ or } E = .77 \text{ volt across}$$

600 ohms for 1 milliwatt = "0" dbm

Since a-c voltmeters are also calibrated in volts, note that "0" dbm corresponds to .77 volt on the scale.

The above dbm terminology can only be used with a steady state sine wave signal on a 600 ohm line. For other line impedances, a correction factor ($10 \log \frac{600}{Z}$) must be applied for the true dbm reading.

Since "0" dbm is a special definition of the db equation, any level above or below it has the same db relationship to zero as the dbm value itself. For example, +6 dbm of signal is 6 db above 0 dbm. In voltage terms this would be 6 db above 0.77 volt which is 1.54 volts (refer to the Conversion Chart).

d. VU (Volume Unit)

The vu (volume unit) is used to express the volume of speech. VU can only be measured with the standard volume indicator (vu meter). This meter has a special ballistic design which integrates the variations and fluctuations of the complex speech wave pattern into a useful meter reading in terms of db above or below a reference volume. Its main purpose in a communication system is to enable the microphone operator to visually monitor his own speech so that he can control his voice volume to the point for which the system has been adjusted. The telephone companies who supply the control lines have regulations regarding the maximum amount of audio power which can be used on their lines. The vu meter provides the station operator with a visual means of making sure that he is not exceeding these regulations. The vu meter also assures the station operator that his voice is of sufficient amplitude to override circuit noise. This provides good clear communications.

On consoles with built-in vu meters, the

meters are calibrated and the outputs adjusted so that when the meters are peaking at zero on speech, +8 vu is being sent into the "line". Plus 8 vu is the American Telephone and Telegraph standard level and is accepted by most telephone companies. If for some reason it is desired to operate at a lower level, the LINE OUTPUT control can be reduced; but this will also reduce the signal-to-noise ratio. This will not affect the vu meter reading because the LINE OUTPUT LEVEL control is beyond the metering point in the console. This is done so that the operator can always read the vu meter at 70% full scale (zero) in the interest of optimum accuracy.

e. Measuring Speech on the Line

On models which have a built-in vu meter, an indication of "0" corresponds to a level of +8 vu on the line when the LINE OUTPUT LEVEL control is turned fully clockwise.

On consoles which do not incorporate vu meters, the measurement can be made with an a-c voltmeter on the line (Motorola Model S1051B, or equivalent). This method can only be used if the proper condition and correction factors are used. A-C voltmeters vary greatly in their speed of response (damping) and consequently will not give a true reading on voice peaks. When an a-c voltmeter is used, a 1000 cps sine wave tone must also be used as the sample signal source through the console for proper accuracy. The instantaneous peaks of a speech wave are equivalent to the instantaneous peaks of a sine wave which have an rms value 6 db higher when transmitted through a compression system. Therefore, a 6 db correction factor must be applied when using this method. In other words, +8 vu of speech will be measured as +14 dbm (3.9 volts) on an a-c voltmeter across the 600 ohm line with a 1000 cps tone transmitted through the compression amplifier at a level which is in compression. If the tone is transmitted through the console from an external oscillator, and the console is equipped with a vu meter, the vu meter will be read "off scale" for +14 dbm of tone on the line. However, if the console is equipped with a 1000 cps alert tone kit and this is used as the signal source, the 6 db correction factor is automatically switched into the vu meter circuit. The vu meter will then read "0" when the alert tone kit puts +14 dbm on the line through the compression amplifier.

f. Conversion Chart

Zero dbm is the accepted standard reference level as defined previously. This reference will be found on an a-c voltmeter calibrated for use across 600 ohms as "0" dbm or 0.77 volt on the voltage scale. This is equivalent to 1 milliwatt of power. Eight dbm occurs at 1.9 volts on the voltage scale and is equal to 6 milliwatts of power.

Older a-c voltmeters were calibrated to a 6 milliwatt reference level across a 500 ohm line. This level was commonly called "0 db" and occurred at 1.7 volts on such meters. Either 8 dbm (modern reference nomenclature) or "0 db" (old standard) are equal to the same power level, that is, 6 milliwatts. The conversion chart below relates these differences for convenience and understanding of the new and old reference levels.

CONVERSION CHART

1 MW - 600 Ohms Reference Level Volts	dbm or db	6 MW - 500 Ohms Reference Level Volts
7.74	+20	17.320
6.15	+18	13.760
4.88	+16	10.930
3.88	+14	8.681
3.08	+12	6.895
2.44	+10	5.477
1.94	+ 8	4.351
1.54	+ 6	3.456
1.22	+ 4	2.745
0.97	+ 2	2.181
0.77	0	1.732
0.61	- 2	1.376
0.48	- 4	1.093
0.38	- 6	0.861
0.30	- 8	0.689
0.24	-10	0.547
0.19	-12	0.435
0.15	-14	0.345
0.12	-16	0.274
0.09	-18	0.218
0.07	-20	0.173

7. USE OF THE VU METER

The readings observed on the vu meter are definite indications which can be used to determine the proper microphone technique. The meter readings will vary if the distance from the operator to the microphone is changed, or when the voice level is varied.

The method of using the vu meter to obtain proper modulation of a radio system utilizing the T1200A Series Remote Control Console is to vary

the distance from the operator to the microphone. This should be performed while talking in a normal voice until the meter indicates as near as possible to the "0" point on voice peaks. If this distance is either too close or too far from the microphone, then the MICROPHONE LEVEL control is not properly set. Readjust this control as instructed in the PRE-OPERATIONAL ADJUSTMENTS section of this manual. It should be noted that the compression amplifier will tend to eliminate any overly loud effects. Consequently, it is only necessary to note the maximum distance at which the "0" deflection can be consistently achieved.

Since speech is a rapidly varying character, the meter needle of the volume indicator responds to a series of "kicks" or deflections of varying amplitude. Some judgement is required to interpret indications of this sort. For steady speech levels, adjustments should be made with the intention of bringing the maximum peaks indicated on the meter up to the "0" vu point. Some major peaks will occasionally occur which will exceed "0" vu. These peaks may be neglected. All of the peaks will not give identical readings, but generally a sufficient number will occur within 0.5 vu of the maximum so that a definite adjustment can be made.

8. AMPLIFIER AND POWER SUPPLY

The amplifier section is of the compression type. It provides a relatively constant amplitude output within the limits of its operational characteristics. A signal input increase of 30 db results in less than 3 db change at the output.

When a certain input voltage is reached, as determined by the setting of the COMPRESSION BIAS control, R27 (refer to schematic diagram 63E862181), a further input voltage increase will not result in a further output voltage increase. This is illustrated in figure 1. In a linear amplifier, an increase in the input voltage results in a proportionate increase in the output voltage. The dashed portion represents how the curve would continue with a linear type amplifier. The solid line curves represent the departure from linear operation with various settings of the COMPRESSION BIAS control, R27.

The compression circuit is a network consisting of resistor R19, and diodes CR2 and CR3. These diodes have the characteristic that their resistance varies with the amount of current that flows through them. This d-c current is supplied by diodes CR4 and CR5 which rectify the amplifier output.

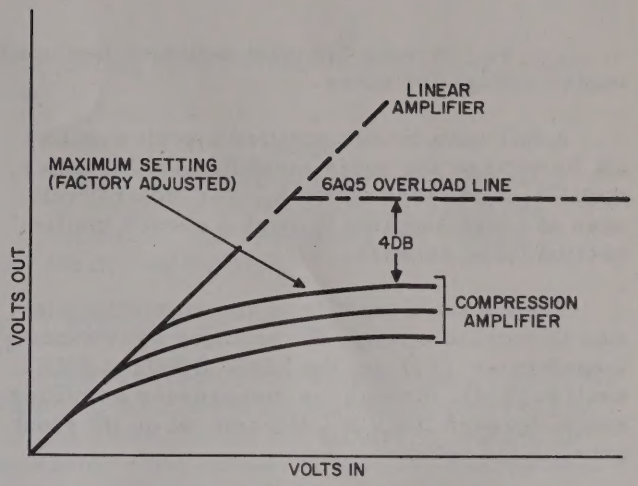


Figure 1

When little or no signal voltage is available at these output diodes, no d-c current is developed and diodes CR2 and CR3 act as large resistors. Consequently, the attenuation, or loss in the network is low (about 4 db).

When a large signal voltage appears at the output circuit, it is rectified, and the resulting d-c current flows through CR2 and CR3, causing their resistance to decrease and the attenuation of the input network to increase.

The compression bias control circuit provides an adjustable bias voltage which is applied to the output rectifiers keeping them from rectifying until the peak audio voltage exceeds this bias level. In this way, the amplifier operates linearly until the output signal voltage exceeds the pre-determined level. The attenuator will then act to hold the output level constant. This circuit will satisfactorily control volume variations of up to 30 db.

The amplifier, consisting of V1 and V2, is a constant gain type which incorporates a negative feedback loop from the 3 ohm winding of the output transformer, through R26 to the first cathode of V1. This tends to maintain the distortion low and keep the gain constant over wide ranges of tube aging.

The power supply section furnishes the following amplifier and d-c control voltages:

1. +250 volts for audio amplifier B+.

2. +140 volts for the push-to-talk relay (K1) and d-c control circuitry.

3. +6 volts for pilot indicator lamp and heater voltage for tubes.

A full wave bridge rectifer circuit supplies all B+ voltage for audio amplification through a multi-section filter network. D-C control voltages are also supplied through a second multi-section filter network.

The received input from the controlled station is coupled through the balanced split winding transformer (T1) to the LINE INPUT LEVEL control (R14), through the compressor amplifier stage, through the VOLUME control on the front panel to the speaker.

For transmission the microphone output is connected to a transistor pre-amplifier through the MICROPHONE LEVEL control (R1), compressor amplifier stage, LINE OUTPUT LEVEL control (R15) and line transformer T1.

Relay K1 is used for microphone push-to-talk functions. The following circuitry switching is affected when relay K1 is actuated by pressing the push-to-talk button on the microphone:

1. The telephone line transformer (T1) is switched from the input of the line amplifier to the output.

2. The speaker is disconnected from the amplifier output.

3. The microphone pre-amplifier is switched to the input of the amplifier.

4. D-C control voltages are connected to the telephone lines.

5. The transmit indicator lamp is turned on.

6. The auxiliary input is switched from terminal #6 to terminal #5 of TB2.

9. TRANSMITTER CONTROL

a. Single-Frequency Models

When the microphone push-to-talk switch is pressed, d-c voltage developed at the console results in approximately a +10 ma current flow through the control line to energize the transmit-receiver relay on the remote control chassis. Actuation of this relay keys the transmitter through the transmit-receive relay on its power supply.

b. Two-Frequency Models

(1) Transmission on Frequency #1

When the microphone push-to-talk switch is pressed, d-c voltage developed at the console results in approximately a +4 ma current flow through the control line. This current actuates the No. 1 transmitter relay which in turn actuates the transmit-receive relay, both of which are located on the remote control chassis at the remote station. Actuation of the transmit-receive relay keys the transmitter through the transmit-receive relay on its power supply. The MUTE RCVR #2 relay will not be energized because the selenium rectifier across its coil will conduct and short-circuit the relay coil.

The No. 2 transmitter relay is not energized for frequency #1 operation, therefore the cathode of the #1 frequency oscillator remains grounded under these conditions, thus permitting transmission on frequency #1.

(2) Transmission on Frequency #2

When the microphone push-to-talk switch is pressed, d-c voltage developed at the console results in an approximate +10 ma current flow through the control line, which actuates the No. 1 transmitter relay and the No. 2 transmitter relay on the remote control chassis. The transmit-receive relay is also energized by the switched 117 v a-c voltage supplied through the circuit path completed by the closed contacts of the No. 1 transmitter relay. Actuation of the No. 2 transmitter relay removes the ground from the transmitter #1 oscillator cathode and completes a circuit which applies a ground to the cathode of the frequency #2 oscillator, thus permitting transmission on frequency #2.

10. RECEIVER CONTROL

a. Single-Frequency Models

In the stand-by condition, the console is ready to reproduce any incoming signal from the line in its loudspeaker. No switching is required.

b. Two-Frequency Models

The two-frequency console has a switch for remotely muting the #2 receiver. When the MUTE RCVR #2 switch is operated, d-c voltage developed at the console results in approximately a -4 ma current flow through the control line which actuates the MUTE RCVR #2 relay on the

remote control chassis of the controlled station. The relay will remain "locked-in" through a set of its own contacts. Actuation of this relay opens the B+ voltage circuit to the #2 receiver, thus muting the receiver. The No. 1 transmitter relay, (on the remote control chassis) which serves as part of a control circuit to supply voltage to the "transmit-receive" relay, does not operate because the selenium rectifier connected across its coil will conduct and short-circuit the relay coil. Since the transmit-receive relay does not become energized, receiver #1 will remain "on" and the transmitter will not be actuated.

To place the #2 receiver back into operating condition, a d-c voltage is developed at the console which results in approximately a +10 ma current flow through the control line which actuates the No. 2 transmitter relay on the remote control chassis. Actuation of this relay opens the holding circuit of the MUTE RCVR #2 relay, thus placing the #2 receiver in operating condition.

NOTE

When the push-to-talk switch is pressed to place the #2 receiver in operating condition, the transmitter is momentarily "on the air".

c. "Private-Line" Models

The "Private-Line" console has a switch for disabling the "Private-Line" squelch of the station receiver. When the MONITOR switch is operated, a d-c voltage is developed at the console which produces a -2 ma current flow through the control line which operates the "Private-Line" relay at the remote station. This relay disables the "Private-Line" squelch circuitry in the station receiver and places it into the standard noise squelch operation. No other remote station relays are activated by this current.

COMMUNICATION LINE FACILITIES

The communication channels available for remote control operation of two-way radio equipment are usually obtained from the facilities installed for normal telephone services. These facilities consist of conductors of various gauges, non-loaded and loaded circuits and may contain repeating coils, composite sets or other intermediate equipment. For these reasons, the resistance, impedance and transmission-frequency characteristics of channels differ, depending upon the location of the terminals of the available facilities. Also as communications systems change and improvements are made, the characteristics of the channels available between two points may be changed.

Channels for service up to approximately twenty miles are usually obtained from cable facilities. Metallic paths are generally employed for such channels when speech or tones in the voice range are to be transmitted. When initially connected, it may be found that the pair does not transmit d-c. The telephone company may have repeat coils installed in the line, therefore it may be necessary to provide for d-c transmission. The T1200A Series Remote Control Console is designed to provide d-c control over the same pair as used for audio (two wire control). If absolutely necessary, however, separate wires can be used for d-c control (four wire). When circuits are longer than twenty miles, the telephone company may be unable to provide communications circuits which will transmit frequencies below 250 cycles; therefore the d-c control will have to be on a separate pair. The upper limit of the frequency band transmitted is generally limited by the cut-off frequency of loading systems which is approximately 2750 cycles to 3500 cycles. Where non-loaded facilities are employed for channels above 3000 cycles, the telephone company may load these circuits for general service reasons.

The Motorola Model T1200A Series Remote Control Consoles are designed to meet all telephone company specifications, regarding specific levels and d-c voltages impressed on the line.

11. SPEECH VOLUME LEVEL

Most telephone companies require that speech levels be transmitted at +8 vu, as read with the Standard Volume Indicator (vu meter).

12. IMPEDANCE

In most applications, a non-loaded cable is used for the shorter circuits. This type of facility is used for speech transmission with equip-

ment designed for use with 600 ohm circuits. For circuits longer than fifteen miles, a loaded cable is usually required, the impedance of which may vary up to 2000 ohms. In unique cases, ratio repeating coils are utilized to match the loaded facilities to the 600 ohm equipment.

Ordinarily, mismatches will cause no serious difficulty. However, in extreme cases excessive peaks and valleys may appear in the response which can be corrected by insertion of these ratio repeat coils between sections of loaded and non-loaded cable.

INSTALLATION PROCEDURE

13. INSPECTION

Unpack the equipment and inspect throughly as soon as possible after delivery. If any part of the equipment has been damaged in transit, report the extent of the damage to the transportation company immediately.

This unit has been inspected and adjusted at the factory to its recommended operation condition. Unless it has been handled roughly in transit or otherwise abused or tampered with, it will require no further adjustment other than those outlined in the following paragraphs before placing it in service.

14. CONSOLE CONNECTIONS

NOTE

To determine whether two or four wire control is desired, refer to the COMMUNICATION LINE FACILITIES section of this manual.

a. Two Wire Control

(1) Place the console at the approximate location which is to be the operator's position. This should be a flat desk-top type surface.

(2) Connect the control line pair (coming from the remote station) to terminals #1 and #2 on terminal board TB2 which is located on the rear of the TLN6017A Amplifier & Power Supply Chassis. Make sure that the correct polarity is observed. This can be checked by referring to the functional diagrams of the remote station. It may be impossible to identify the wires due to the length and routing of the control line pair. Therefore, it is recommended that trial and error be used to determine the correct polarity. That is, if the remote control functions do not operate, or operate incorrectly, then reverse the connections at terminals #1 and #2.

(3) Connect the microphone into the six-prong MICROPHONE receptacle located in the rear of the TLN6017A Amplifier & Power Supply Chassis. If the microphone has "Private-Line" facilities, it is necessary to connect three of the four spade lug leads to terminal board TB2 as follows:

1. RED lead to terminal #18.
2. BLK lead to terminal #23.
3. GRN lead to terminal #24.
4. Tape back the WHT insulated lead. DO NOT connect this lead to the console.

(4) Connect the power cord of all models except the Model T1206A to any convenient 117 volt, 60 cycle power source (the Model T1206A uses a 117 volt, 50 cycle power source). Connect the spade lug of the a-c plug to a good ground connection. Once the a-c power is connected, the console is in operation.

b. Four Wire Control

(1) Remove jumper JU9 (terminals #21 and #22) and JU10 (terminals #19 and #20) from the terminal board TB2 located in the rear of TLN6017A Amplifier and Power Supply Chassis.

(2) Connect the two wire audio line to terminals #1 and #2 of terminal board TB2.

(3) Connect the d-c control line pair to terminals #20 and #22 of TB2. Be sure that the correct polarity is observed. This can be checked by referring to the functional diagrams of the remote station. Due to the length and routing of the control line pair, it may be impossible to determine the correct polarity. Therefore, it is recommended that trial and error be used to determine the correct polarity. If the remote control functions do not operate or operate incorrectly, then reverse the connections at terminals #20 and #22.

(4) Connect the microphone into the six-prong MICROPHONE receptacle located in the rear of the TLN6017A Amplifier & Power Supply Chassis. If the microphone has "Private-Line" facilities, it is necessary to connect three of the four spade lug leads to terminal board TB2 as follows:

1. RED lead to terminal #18.
2. BLK lead to terminal #23.
3. GRN lead to terminal #24.
4. Tape back the WHT insulated lead. DO NOT connect this lead to the console.

(5) Connect the power cord of all models except the Model T1206A to any convenient 117 volt, 60 cycle power source (the model T1206A uses a 117 volt, 50 cycle power source). Connect the spade lug of the a-c plug to a good ground connection. Once the a-c power is connected, the console is in operation.

15. MULTIPLE CONSOLE CONNECTIONS

Any number of consoles may be connected in parallel; however, the losses encountered in the telephone line must be taken into consideration and compensated for to obtain the required line levels. The console, as shipped from the factory, is designed to terminate in a 600 ohm impedance. Consoles connected in parallel should be installed far enough apart to prevent audio feed-back between the microphones and speakers. The paralleled consoles are connected by means of a two wire or four wire line.

a. Two Wire Line Connections

(1) Connect one wire of the line from terminal #1 of TB2 of the first console to terminal #1 of TB2 of the second console.

(2) Connect the other wire of the line from terminal #2 of TB2 of the first console to terminal #2 of TB2 of the second console.

The same respective line connections apply to each additional console as it is added into the system.

b. Four Wire Line Connections

(1) Remove jumper #9 and #10 from TB2.

(2) Connect one wire of the line from terminal #1 of TB2 of the first console to terminal #1 of TB2 on the second console.

(3) Connect the second wire of the line from terminal #2 of TB2 of the first console to terminal #2 of TB2 on the second console.

(4) Connect the third wire of the line from terminal #20 of TB2 of the first console to terminal #20 of TB2 on the second console.

(5) Connect the fourth wire of the line from terminal #22 of TB2 of the first console to terminal #22 of TB2 on the second console.

The same respective line connections apply to each console as it is added into the system.

16. CIRCUITRY MODIFICATIONS

An important factor in parallel console operation is that the total parallel impedance should be maintained at approximately 600 ohms. To maintain this level, specific circuitry changes are required to modify the input impedance. These changes are indicated in the following chart. The resistors in the chart are listed by the corresponding reference number on Schematic Diagram 63E862181. The total parallel impedance is obtained by dividing the effective termination impedance by the number of consoles connected in parallel.

NUMBER OF CONSOLES CONNECTED IN PARALLEL	RESISTOR TO BE REMOVED	EFFECTIVE TERMINATION IMPEDANCE OF EACH CONSOLE SEPARATELY	TOTAL PARALLEL IMPEDANCE (NOMINAL)
2	R12 and R47	1200 ohms	600 ohms
3 or 4	R11, R12 and R47	2000 ohms	600 ohms
5 or 6	R10, R11, R12 and R47	3300 ohms	550 to 660 ohms
7 or more	R9, R10, R11, R12, R41 and R47	5500 ohms	Less than 700 ohms

NOTE

For specific system applications where long control lines and eight or more consoles are to be used, contact the local sales representative of Motorola, Inc., Communications Division.

PRE-OPERATIONAL ADJUSTMENTS

NOTE

Refer to the THEORY OF OPERATION, paragraph 6.a., for description and definitions of the audio level measurement terminology. Before placing the console into use, the following adjustments must be made on the controls located on the console chassis.

17. COMPRESSION BIAS

a. General Information

The remote control console is shipped with the COMPRESSION BIAS control pre-set to the correct level at the factory. This setting should be checked to assure that the control has not changed during shipment or handling.

NOTE

This control does not set the amount of compression for amplifier input signals (see paragraphs 18 and 20 for that adjustment). The COMPRESSION BIAS controls the console amplifier, limiting it so that it does not overload. Improper adjustment of this control will result in unnecessary distortion in the amplifier.

b. Adjustment Procedure

(1) Remove the jumper connected between TB2 terminals #10 and #11.

(2) Connect a 3.2 ohm resistor between TB2 terminals #9 and #12.

(3) Connect an a-c voltmeter (Motorola Model S1051B, or equivalent) across TB2 terminals #9 and #12.

(4) Connect a ground to the end of R43 (4.7K) not wired to C18 (125 uf).

(5) Apply a signal of 1000 cycles per second to TB2 terminals #1 and #2.

(6) Adjust this signal until the voltmeter (connected across TB2 terminals #9 and #12) indicates 3.1 volts (3 watts).

(7) It is advisable to check that the amplifier is capable of producing at least 3 watts. To accomplish this, connect an oscilloscope at TB2 terminals #9 and #12 for presence of serious distortion (clipping etc.) and if the waveform is not relatively pure up to at least 3 watts, the condition should be corrected by replacing V2 (6AQ5) or by remedying a possible low B+ supply.

(8) Disconnect and remove the ground placed on R43.

(9) Adjust the COMPRESSION BIAS control for an output of approximately 2 volts (4 db below 3 watts). Due to the time constant in the compression circuit, sufficient time should be allowed to obtain a true meter indication.

(10) As a check for proper operation, increase the input approximately 30 db. The output should not increase more than 3 db and should remain undistorted as observed on the oscilloscope.

18. LINE OUTPUT LEVEL

a. General Information

The purpose of this adjustment is to provide the correct audio signal level to the remote control line when transmitting. Most telephone companies prescribe a maximum of +8 vu of speech on their lines. This is to prevent crosstalk between pairs in their cables and overhead lines. It is wise to operate your console at the maximum permissable output level since this will result in the best possible signal-to-noise ratio on the line.

b. Adjustment Procedure

The console must be keyed (on transmit) for this adjustment. Grounding terminal #8 on TB2 is a convenient method for this purpose. For normal operation turn the LINE OUTPUT LEVEL control to its full clockwise position. This will provide +8 vu of speech on the line. On consoles equipped with a vu meter this level will indicate as "0" on the meter. This adjustment can be checked by placing an a-c voltmeter on the line (terminals #1 and #2 on TB2) and injecting a 1000 cps sine wave signal into the console amplifier auxillary input (terminals #14 and #13 on TB2).

NOTE

Be careful not to ground either side of the line output terminals to the console chassis with the voltmeter leads. This

***NOTE* (Cont'd)**

condition would cause 1/2 of the line matching transformer to be shorted out.

The 1000 cps signal must be of sufficient magnitude to drive the amplifier about 10 db into compression. The voltmeter will then read approximately +14 dbm (3.9 volts) which is the equivalent of +8 vu of speech. If this reading is slightly higher than +14 dbm, then reduce the COMPRESSION BIAS control slightly until +14 dbm is obtained. To make sure the amplifier is 10 db into compression for this check, connect a d-c voltmeter between ground and metering point "A". Start the 1000 cps oscillator at zero voltage and advance its output control slowly while observing the d-c voltmeter. At levels below compression, a positive voltage will be observed. When compression is reached the meter will go negative. When 10 db of compression is reached, the d-c voltmeter will read approximately -1.7 volts.

NOTE

If the Motorola TLN6132A Alert Tone Kit is used for this check, its output is sufficient to operate the amplifier well into compression.

If it is desired to use a level lower than +8 vu, then the preceding a-c voltmeter method must be used. Follow the same procedure except after obtaining +14 dbm, reduce the LINE OUTPUT LEVEL control to the desired lower level. For example, if +3 vu is the desired level, then adjust the LINE OUTPUT LEVEL control for +9 dbm (2.2 volts) on the meter. On consoles equipped with a vu meter, the vu meter reading will be "0" regardless of the setting of the LINE OUTPUT LEVEL control. This is because the meter is placed ahead of this control in the amplifier circuit so that the operator can always read the vu meter at 70% of its full scale reading regardless of the line level setting. In the preceding example, "0" on the vu meter would indicate +3 vu on the line.

19. MICROPHONE LEVEL

a. General Information

This adjustment is required to provide correct operation of the compression amplifier on transmitted signals. Two important factors enter into the adjustment: (1) the surrounding noise, and (2) the acoustics of the room. If the MICROPHONE LEVEL control is adjusted too high, the background noise will be included in the message at a distracting level because the amplifier will compress the operator's voice while amplifying the background noise freely. The result will be a reduced signal-to-noise ratio. Also the "live" acoustics of the average room will cause "hollow" or "boxy" sounding voice reproduction. These conditions seriously detract from the intelligibility of speech. It is important to note that a microphone "exaggerates" any noise in the area. If the microphone level is adjusted too low, the signal will be inadequate to modulate the transmitter to its full capability and the result will be a soft message which cannot always be understood.

b. Adjustment Procedure

The MICROPHONE LEVEL control should be adjusted to a setting just below the point where the compressor begins to operate. To make this adjustment on consoles not equipped with a vu meter, connect a d-c voltmeter (approx. 3 volts full scale) between ground and metering point "A". Place the microphone approximately eight inches from the lips. Press the "push-to-talk" switch and speak normally into the microphone. Slowly advance the MICROPHONE LEVEL control clockwise until the d-c meter just moves negative occasionally on voice peaks. This is the optimum setting for this control. On consoles equipped with a vu meter, slowly advance this control until the meter reads "0" on normal voice peaks. Ignore the occasional overshoots produced by emphasized words. In either case, this adjustment procedure should be repeated several times to achieve the best results.

It was recommended that the microphone be placed about eight inches from the lips for this adjustment. Experience has shown this to be the best distance for average background noise. If the room is particularly noisy, the operator will have to work closer than eight inches and the MICROPHONE LEVEL control must be decreased accordingly. If the room is particularly quiet, the operator may work further away than eight inches and the MICROPHONE LEVEL control must be increased accordingly. It must be remembered that the terms "average", "noisy", and "quiet" are all relative. Therefore it is recommended that at the end of all of the pre-operational adjustments, the microphone level setting be evaluated on a system listening test to determine if the background noise has been properly accounted for.

20. LINE INPUT LEVEL

a. General Information

These adjustments are required to provide correct operation of the compression amplifier on the received signals. It is assumed that the base station receiver VOLUME control has been properly adjusted at the station site. This volume adjustment, described in the base station instruction manual, is a necessary pre-requisite to the line input level adjustment. The LINE INPUT LEVEL control should be adjusted to a level just below that point where the compressor begins to operate. The amplifier will then reproduce normal signals at an adequate level for comfortable listening with negligible compression. If this level is set too high, the amplifier will operate in compression all the time and consequently the quality of normal signals will sound unnatural. Compression will also reduce the effective signal-to-noise ratio. This is especially important in systems using "Private-Line" where the coding tone audibility will be increased by the same number of db as the voice signal is compressed. Intercom signals are normally higher in level than the remote station signals because of the proximity of their source. Therefore, they will drive the amplifier into compression most of the time. In these instances, the compressor prevents the intercom message from "blasting".

b. Adjustment Procedure

NOTE

If a line equalizer kit is used with a console, equalization must be made before adjusting the line input level.

To make the adjustment on consoles not equipped with a vu meter, connect a d-c voltmeter (approx. 3 volts full scale) between ground and metering point "A" (junction of R22 and R42). With a normal signal being sent to the console over the control line from the base station receiver, advance the LINE INPUT LEVEL control clockwise until the d-c meter just moves negative occasionally on voice peaks. This is the optimum setting for this control. On consoles equipped with a vu meter, the LINE INPUT LEVEL control should be slowly advanced until the vu meter approaches "0" on voice peaks. Caution should be exercised at this point since it is easy to overshoot this adjustment. This overshooting will occur because the meter will continue to read "0" with a further increase. This happens because of compression. The control should be backed off and the adjustment repeated several times to verify its setting.

21. BASE STATION LINE INPUT CONTROL ADJUSTMENT

a. General Information

The LINE INPUT LEVEL control is located in the base station on its remote control chassis. The adjustment of this control is described in the base station instruction manual under system adjustments on the remote control chassis. However, the success of all of the console adjustments just described are dependent upon the correct setting of this control at the base station. Therefore, its adjustment procedure is repeated here to emphasize its importance.

Up to this point; the console has been adjusted to provide the correct signal into the audio transmission line. Some of this signal will be lost down the line depending upon its nature and length. At the remote end of the line, the LINE INPUT CONTROL (on the remote control chassis) acts as an attenuator to set the correct amount of signal into the audio circuit of the transmitter. Obviously then, the setting of this control will depend upon the amount of signal put into the line at the sending end, and the length of the line.

Normally, the audio circuit of a Motorola base station transmitter is designed so that 0.25 volt of sine wave signal (at 1000 cps) will just provide full system deviation. Thus we say that the transmitter audio sensitivity is 0.25 volt for full system deviation. Some transmitters have a facility for increasing this sensitivity by 3 db through a simple wiring change. This is not normally required for remote operation. However, if further details are desired, see your base station instruction manual.

b. Adjustment Procedure

NOTE

If a Motorola TK556 Line Equalizer Kit is used, it should be adjusted first before making this adjustment.

Connect a high impedance voltmeter (Motorola Model S1051B, or equivalent) across the transmitter audio input terminals. Transmit a 1000 cps test signal from the console at its maximum permissible output level (normally 14 dbm). Adjust the LINE INPUT LEVEL control on the base station for 0.25 volt on the meter. This adjustment will then provide the correct speech level to the transmitter when the microphone is used at the console.

22. LINE CURRENT ADJUSTMENT (REQUIRED FOR TWO-FREQUENCY OPERATION ONLY)

A separate adjustment is required for two-frequency operation. A line current of +4 to +6 ma is required for F1 operation when a two frequency front panel is used. The adjustment is made by means of the potentiometer mounted on the TK551 Two Frequency Kit switch. These adjustments should be made when the console is connected to a standard telephone line.

Remove jumper JU9 (terminals #21 and #22 of TB2) and connect an ammeter across these terminals with terminal #22 as the positive side and terminal #23 as the negative side. Place the frequency selector switch to the F1 position and key the transmitter. Adjust the potentiometer to obtain a reading of +4 to +6 ma on the ammeter. Remove the ammeter from the circuit and replace jumper JU9 previously removed.

OPERATING PROCEDURES

23. TURNING "ON" THE EQUIPMENT

When the a-c primary power source is connected, the remote control console is ready for operation. If the model includes an a-c ON-OFF switch, place the switch in the ON position.

24. TO RECEIVE

When the remote control console is turned "on", it is in the "receive" condition. The only action required on the part of the operator is to adjust the volume control on the front of the console to a comfortable listening level.

If two messages are being heard simultaneously, (from two receiver controlled equipment) the #2 receiver can be muted, thus permitting the message from the #1 receiver to be heard.

To mute the #2 receiver, hold the MUTE RCVR #2 switch (on models equipped with this feature) in the "up" position momentarily. This will mute the #2 receiver.

To place the #2 receiver in operating condition, place the frequency selector switch in the F2 position and momentarily press the push-to-talk switch on the microphone. This will place the #2 receiver in operating condition again.

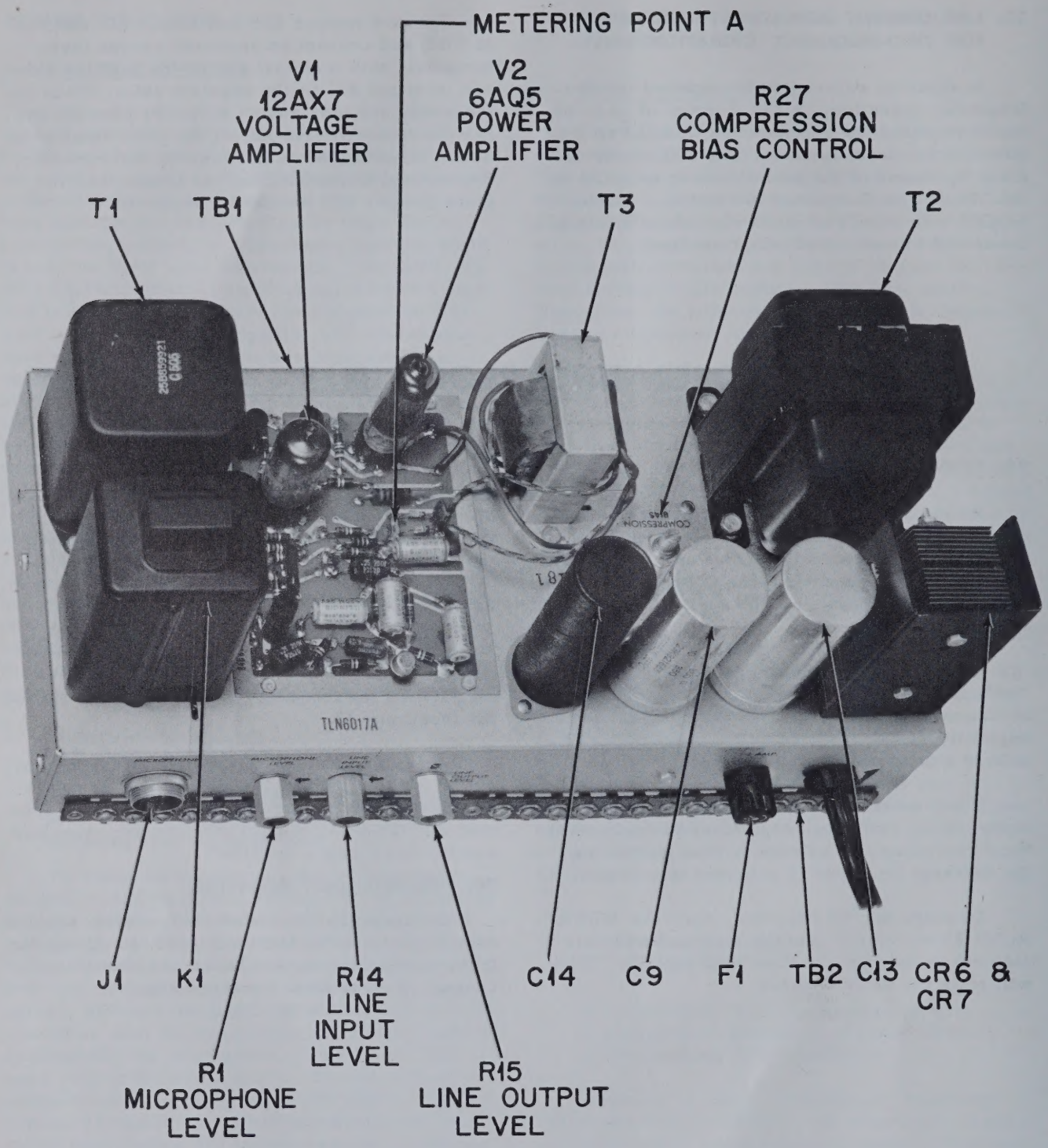
25. TO TRANSMIT

If the remote control console includes a frequency selector switch, place the switch in the F1 position for frequency #1 or in the F2 position for frequency #2.

Press the push-to-talk switch on the microphone (or foot pedal). The red "M" transmit indicator lamp on the front panel will light to show that the transmit control circuits are energized and the microphone is "live".

26. "PRIVATE-LINE" DISABLING

To disable the "Private-Line" receiver squelch circuit, actuate the MONITOR switch. If signals from another station are heard, wait until the channel is clear before transmitting.


METERING POINT A
V1
12AX7
VOLTAGE
AMPLIFIER
V2
6AQ5
POWER
AMPLIFIER
R27
COMPRESSION
BIAS CONTROL
T1
TB1
T3
T2
TLN6017A
J1
K1
R14
LINE
INPUT
LEVEL
C14
C9
F1
TB2
C13
CR6 &
CR7
R1
MICROPHONE
LEVEL
R15
LINE OUTPUT
LEVEL

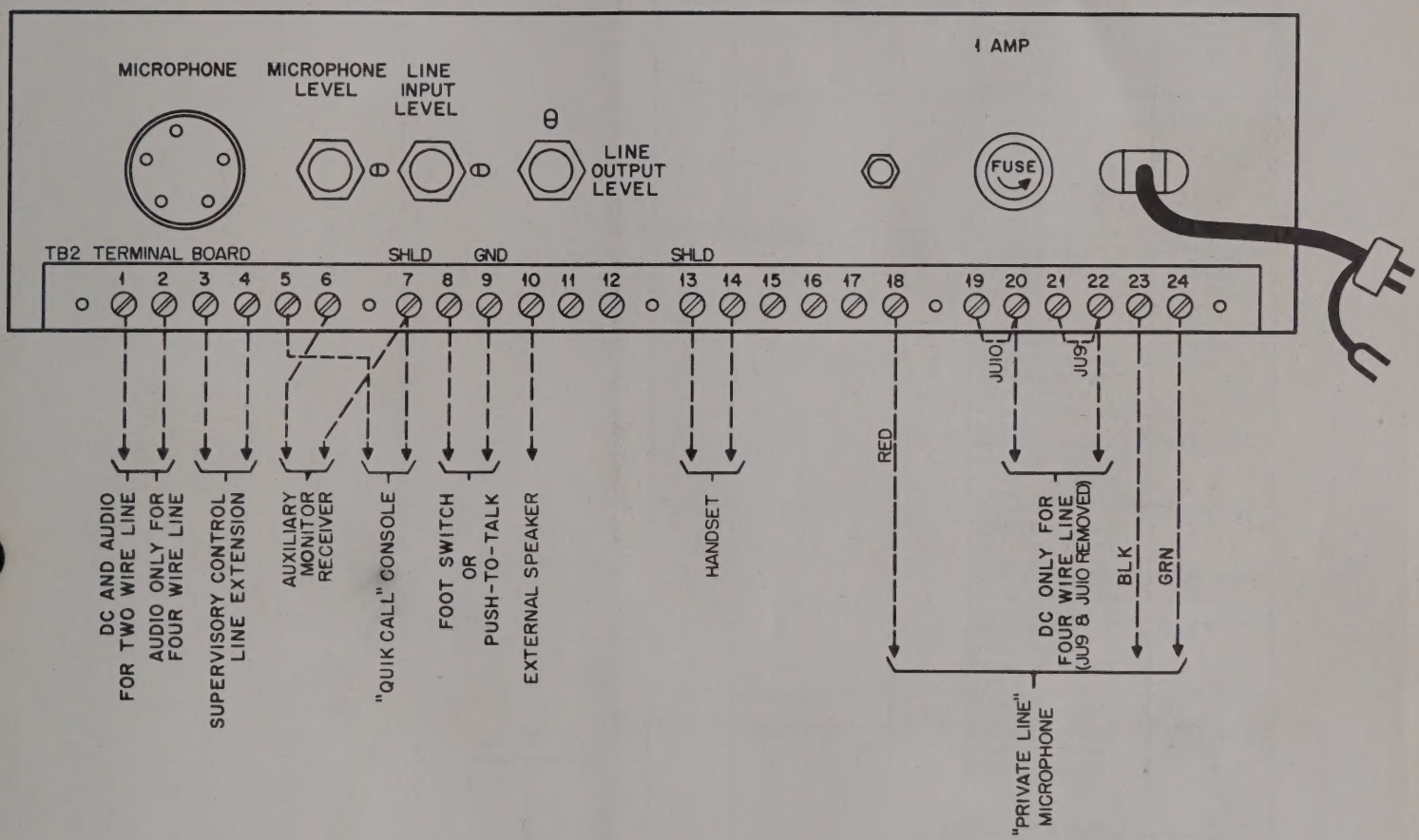
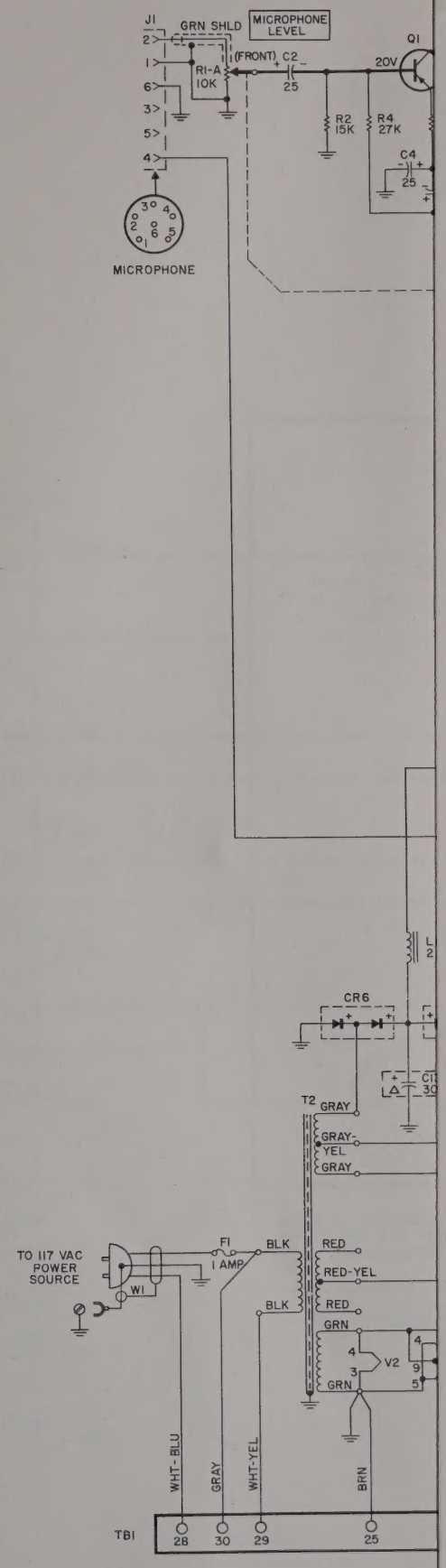


DIAGRAM NO. 63B862189

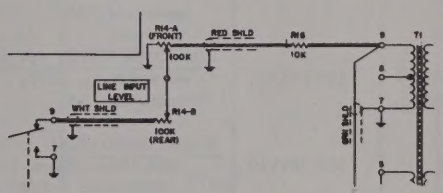
NOTE:
THESE ARE THE MOST TYPICAL EXTERNAL CONNECTIONS. REFER TO INSTRUCTION SECTIONS FOR CONNECTIONS OF ITEMS NOT SHOWN HERE.

Model TLN6017A Amplifier & Power Supply Chassis
Typical External Connection Diagram
Motorola No. 63B862189-O

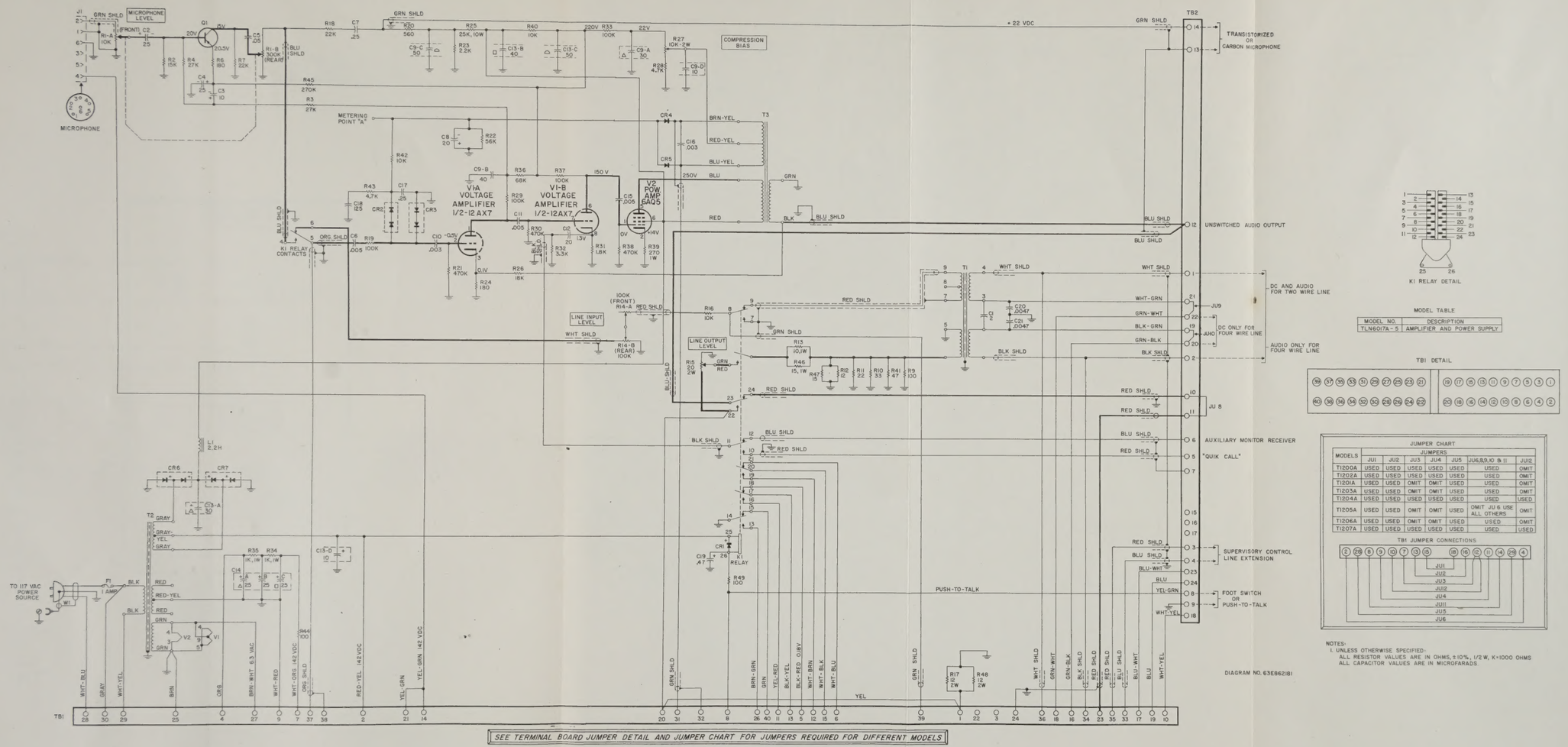


REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
D	TLN6017A-1		IN JUMPER CHART JU7 WAS SHOWN AS "OMIT" FOR MODEL T1205A	JUMPER DETAIL
E	TLN6017A-1		ADDED PIN NUMBER TO V1B ADDED COLOR CODING TO 8, 26 & 40 ON TB1, AND TIED IN GRID ON V2. ADD METERING POINT A	V1B, V2 & TB1
F	TLN6017A-2	C19	WAS 5 uf	TB1-8
		JU6	REMOVED JU6 BETWEEN C13D AND R35	GRAY-YEL CENTER TAP LEAD OF T2 SECONDARY
			ADD JUMPER (JU6) BETWEEN ADDED TERMINALS 2 AND 4 ON TERMINAL BOARD IN JUMPER DETAIL	JUMPER CHART
			ADD ORG-LEAD BETWEEN JUNCTION OF R35, C14A AND TERMINAL 4 OF TB1	TB1-4
G	TLN6017A-3	R49	ADDED	TB1-8
			JUMPER REMOVED, BETWEEN TB1-24 & TB1-5	
			GND. RELOCATED FROM R14-B REAR TO R14-A FRONT	LINE INPUT LEVEL
			TRANSPOSE YEL-GRN LEADS OF TERM. 14 & 21 OF TB1	TB1
H	TLN6017A-4	C2	WAS 20 uf	Q1
		C4	WAS 20 uf	
J	TLN6017A-5		CIRCUIT REVISED. CIRCUIT WAS AS SHOWN BELOW	LINE INPUT LEVEL
J1			DIAGRAM REDRAWN	
J2	TLN6017A-5		TB1 JUMPER CONNECTIONS WAS JUMPER DETAIL	JUMPER CHART



Model TLN6017A Amplifier & Power Supply Chassis
Schematic Diagram
Motorola No. 63E862181-J2
5/25/61-CP



SEE TERMINAL BOARD JUMPER DETAIL AND JUMPER CHART FOR JUMPERS REQUIRED FOR DIFFERENT MODELS

MODEL TABLE

MODEL NO.	DESCRIPTION
TLN6017A-5	AMPLIFIER AND POWER SUPPLY

TB1 DETAIL

JUMPER CHART

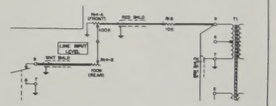
MODELS	JUMPERS						
	JU1	JU2	JU3	JU4	JU5	JU6,8,9,10 & 11	JU12
T1200A	USED	USED	USED	USED	USED	USED	OMIT
T1202A	USED	USED	USED	USED	USED	USED	OMIT
T1201A	USED	USED	OMIT	OMIT	USED	USED	OMIT
T1203A	USED	USED	OMIT	OMIT	USED	USED	OMIT
T1204A	USED	USED	USED	USED	USED	USED	USED
T1205A	USED	USED	OMIT	OMIT	USED	OMIT JU 6 USE ALL OTHERS	OMIT
T1206A	USED	USED	OMIT	OMIT	USED	USED	OMIT
T1207A	USED	USED	USED	USED	USED	USED	USED

TB1 JUMPER CONNECTIONS

NOTES:
1. UNLESS OTHERWISE SPECIFIED:
ALL RESISTOR VALUES ARE IN OHMS, ±10%, 1/2 W, K=1000 OHMS
ALL CAPACITOR VALUES ARE IN MICROFARADS.

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
D	TLN6017A-1		IN JUMPER CHART JU7 WAS SHOWN AS "OMIT" FOR MODEL T1205A	JUMPER DETAIL
E	TLN6017A-1		ADDED PIN NUMBER TO V1B ADDED COLOR CODING TO 8, 26 & 40 ON TB1, AND TIED IN GRID ON V2, ADD METERING POINT A	V1B, V2 & TB1
F	TLN6017A-2	C19	WAS 5 uf	TB1-8
		JU6	REMOVED JU6 BETWEEN C13D AND R35	GRAY-YEL CENTER TAP LEAD OF T2 SECONDARY
			ADD JUMPER (JU6) BETWEEN ADDED TERMINALS 2 AND 4 ON TERMINAL BOARD IN JUMPER DETAIL	JUMPER CHART
			ADD ORG-LEAD BETWEEN JUNCTION OF R35, C14A AND TERMINAL 4 OF TB1	TB1-4
G	TLN6017A-3	R49	ADDED	TB1-8
			JUMPER REMOVED, BETWEEN TB1-24 & TB1-5	
			GND. RELOCATED FROM R14-B REAR TO R14-A FRONT	LINE INPUT LEVEL
			TRANSPOSE YEL-GRN LEADS OF TERM. 16 & 21 OF TB1	TB1
H	TLN6017A-4	C2	WAS 20 uf	Q1
		C4	WAS 20 uf	
J	TLN6017A-5		CIRCUIT REVISED, CIRCUIT WAS AS SHOWN BELOW	LINE INPUT LEVEL

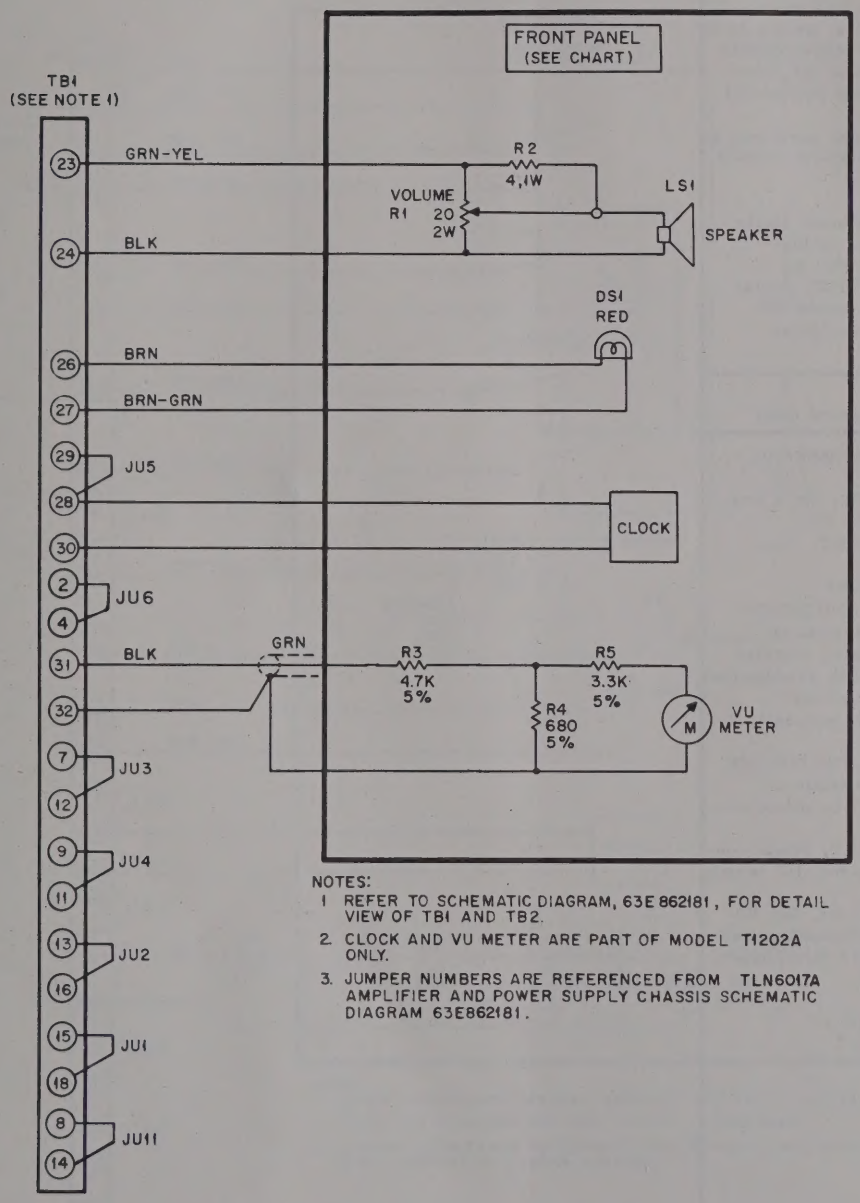


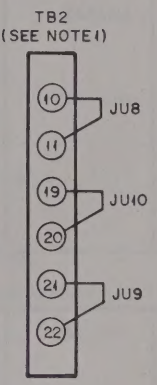
J1			DIAGRAM REDRAWN	
J2	TLN6017A-5		TB1 JUMPER CONNECTIONS WAS JUMPER DETAIL	JUMPER CHART

Model TLN6017A Amplifier & Power Supply Chassis
Schematic Diagram
Motorola No. 63E862181-J2
5/25/61-CP

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1		JU6	JUMPER JU6 AND TERMINALS 2 AND 4 ADDED.	TB1
A	TGN6004A	R2	WAS 17K892469 METER BRKT. WAS 7B850900	PARTS LIST
			CLOCK CABLE WAS 30A76858	
			ADDED SPACER 43A82275C01	





FRONT PANEL	T1200A	T1202A
MODEL TGN6010A LESS CLOCK AND VU METER	X	
MODEL TGN6004A INCLUDES CLOCK AND VU METER		X

DIAGRAM NO. 63C862182

NOTES:
1. REFER TO SCHEMATIC DIAGRAM, 63E862181, FOR DETAIL VIEW OF TB1 AND TB2.
2. CLOCK AND VU METER ARE PART OF MODEL T1202A ONLY.
3. JUMPER NUMBERS ARE REFERENCED FROM TLN6017A AMPLIFIER AND POWER SUPPLY CHASSIS SCHEMATIC DIAGRAM 63E862181.

Models T1200A and T1202A
Remote Control Consoles
Intercabling Diagram
Motorola No. 63C862182-A
5/25/61-CP

PARTS LIST for Diagram 63E862181-J2

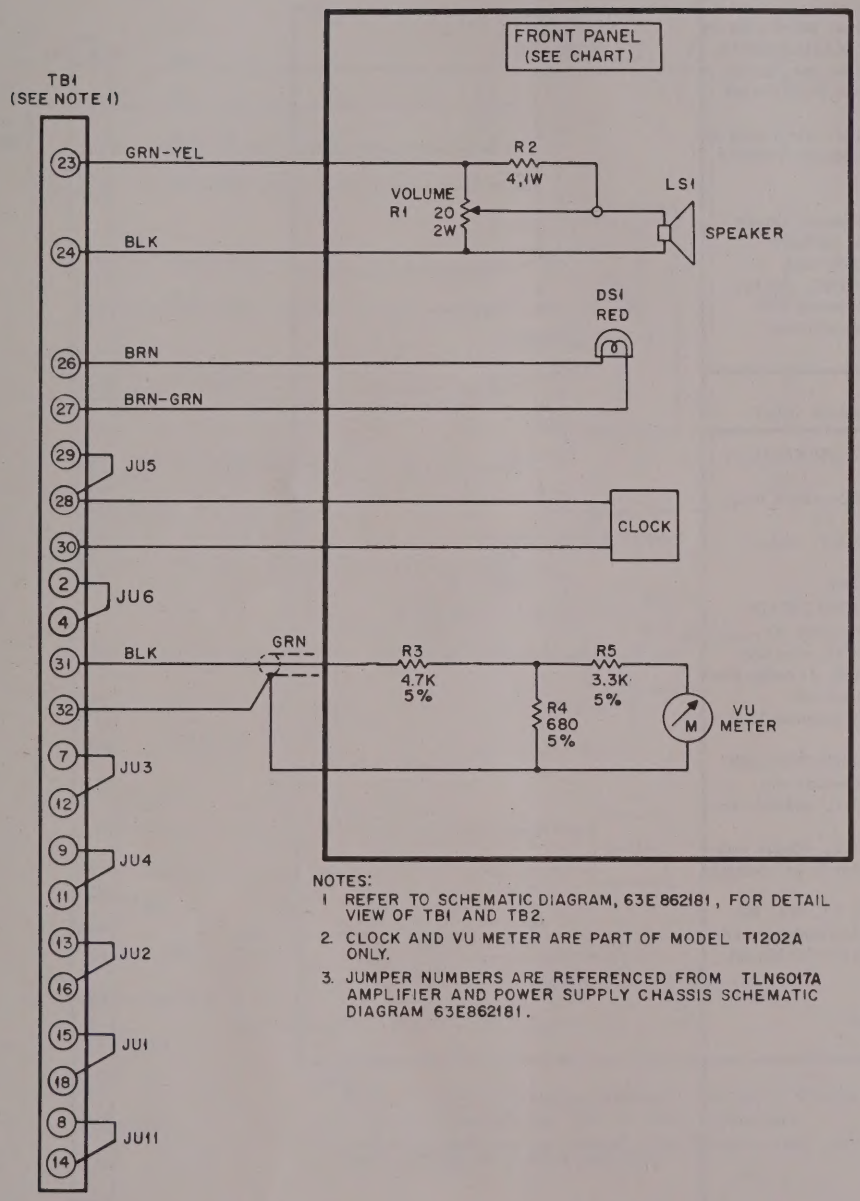
REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		CAPACITOR, fixed:
C1	8C850995	2 uf ±20%; 200 vdcw
C2	23B844927	electrolytic; 20 uf +100-10%;
	or 23C855013	25 vdcw
C3	23K863543	electrolytic; 10 uf +100-10%; 50 vdcw
C4		same as C2
C5	8K858111	.05 uf ±25%; 50 vdcw
C6	8B850625	mylar; .005 uf ±10%; 600 vdcw
C7	8K834384	.25 uf ±20%; 200 vdcw
C8		same as C2
C9	23K821665	electrolytic; 4 section; consists of:
C9A		△ 30 uf +100-10%; 350 vdcw
C9B		□ 40 uf +50-10%; 350 vdcw
C9C		⏢ 50 uf +100-10%; 350 vdcw
C9D		10 uf +100-10%; 350 vdcw
C10	21K850994	.003 uf ±5%; 50 vdcw
C11		same as C6
C12		same as C2
C13		same as C9
C14	23K821735	electrolytic; 3 section; consists of:
C14A		△ 25 uf +50-10%; 250 vdcw
C14B		25 uf +50-10%; 250 vdcw
C14C		□ 25 uf +50-10%; 250 vdcw
C15		same as C6
C16	21K858108	.003 uf ±25%; 250 vdcw
C17		same as C7
C18	23K840707	electrolytic; 125 uf +100-10%; 18 vdcw
C19	8K859179	mylar; tubular; .47 uf ±20%; 400 vdcw
C20	21K837747	.0047 uf ±10%; 500 vdcw
C21		same as C20
		RECTIFIER, metallic: selenium:
CR1	48B833354	40 ma at 130 volts; cathode lead coded "+"
CR2	48A824739	200 ua at 40 volts; coded GRN body; RED tip; cathode coded RED dot
CR3		same as CR2
CR6	48K800715	2 series sections, 16 plate total;
	or 48K858204	100 ma at 160 volts; cathode coded "+"
CR7		same as CR6
		CRYSTAL UNIT, rectifying:
CR4	48C847274	germanium; diode
CR5		same as CR4
		FUSE, cartridge:
F1	65K804910	slow blow; glass; 1 ampere; 125 volt; 1-1/4" x 1/4"
		CONNECTOR, receptacle;
J1	9A881071	female; 6 contact; polarized; round molded black phenolic base in metal shell; chassis mounted
		RELAY, armature:
K1	59K82744	contact arrangement, 1 form "D" 7 form "C"; does not include 15B80676 COVER, relay; cover must be ordered separately
		REACTOR, filter:
L1	25B825358	choke; 2.2 henries at 100 ma DC

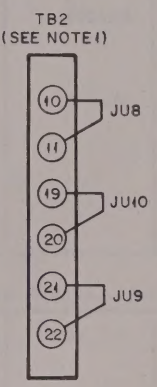
REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		TRANSISTOR:
Q1	48A124313	type 2N651; P-N-P
		RESISTOR, fixed: composition; ±10%; 1/2 w; unless otherwise stated
R1	18C863544	variable: 2 section; consists of:
R1A		10K ±20%; 1/4 w; linear; front
R1B		300K ±20%; 1/8 w; "A" taper; rear
R2	6R6477	15K
R3	6R6434	27K
R4		same as R3
R5		NOT USED
R6	6R5660	180 ohm
R7	6R6397	22K
R8		NOT USED
R9	6R6326	100 ohm
R10	6R2036	33 ohm
R11	6R6406	22 ohm
R12	6R2030	12 ohm
R13	6R129512	10 ohm ±5%; 1 w
R14	18K863545	variable: 2 section; consists of:
R14A		100K ±20%; 1/4 w; linear; front
R14B		100K ±20%; 1/4 w; linear; rear
R15	18K850743	variable: wire wound; 20 ohm ±20%; 2 w
R16	6R6320	10K
R17	6R118237	12K; 2 w
R18		same as R7
R19	6R6031	100K
R20	6R6291	560 ohm
R21	6R6377	470K
R22	6R6378	56K
R23	6R6069	2.2K
R24		same as R6
R25	17K824569	wire wound; 25K; 10 w
R26	6R5591	18K
R27	18K824757	variable; wire wound; 10K; 2 w; linear
R28	6R6080	4.7K
R29		same as R19
R30		same as R21
R31	6R2089	1.8K
R32	6R5581	3.3K
R33		same as R29
R34	6R6327	1K; 1 w
R35		same as R34
R36	6R6074	68K
R37		same as R29
R38		same as R21
R39	6R6336	270 ohm; 1 w
R40	6R6320	10K
R41	6R5550	47 ohm
R42		same as R40
R43		same as R28
R44		same as R9
R45	6R6414	270K
R46	6R129513	15 ohm ±5%; 1 w
R47	6R2034	15 ohm
R48		same as R17
R49		same as R9
		TRANSFORMER,
T1	25C859921	AF: line type; consisting of: primary, two 150 ohm windings to match 600 ohm line; secondary #1, 600 ohm tapped at 50 ohms; secondary #2, 3.2 ohm

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		TRANSFORMER, (cont'd)
T2	25C850913	Power: consisting of: primary, 117 volt, 60 cycle; dc resistance 10.9 ohms; BLACK, BLACK conductors; secondary, high voltage #1; 212 V AC (loaded); total dc resistance 331 ohms; RED, RED conductors with RED-YEL center tap conductor; secondary, high voltage #2; 212 V AC (loaded); total dc resistance 45.3 ohms; SLATE, SLATE conductors with SLATE-YEL center tap conductor; secondary, filament; 6.3 V AC (loaded); dc resistance .266 ohms; GRN-GRN conductors
T3	25C855132	AF: line type; consisting of: primary, 5,000 ohms impedance at 45 ma DC; dc resistance 450 ohms; BLU, RED conductors; secondary #1, 500 ohms impedance; dc resistance 120 ohms; BLU-YEL, BRN-YEL conductors with RED-YEL center tap conductor; secondary #2, 3.2 ohms impedance; dc resistance .295 ohms; GRN, BLK conductors
		BOARD, terminal:
TB1	31B850998	40 solder lug terminals; numbered 1 to 40
TB2	31B850923	24 screw terminals; numbered 1 to 24
		TUBE, electron:
V1	195T134A01	12AX7
V2	195T101A01	6AQ5
		CABLE ASSEMBLY, power:
W1	30B850926	consists of 3 conductor, rubber covered cable, 6 ft. long, permanently attached 2 contact male plug; includes lug for connection to external ground
		FUSEHOLDER:
XF1	9B820279	extractor post type; molded black bakelite bayonet base; single hole chassis mounting; for 1-1/4" x 1/4" fuse
		SOCKET, tube:
XV1	9C850738	female; 9 contact; miniature; molded black phenolic base; special type for printed circuit
XV2	9B850739	female; 7 contact; miniature; molded black phenolic base; special type for printed circuit

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1		JU6	JUMPER JU6 AND TERMINALS 2 AND 4 ADDED.	TB1
A	TGN6004A	R2	WAS 17K892469 METER BRKT. WAS 7B850900	PARTS LIST
			CLOCK CABLE WAS 30A76858	
			ADDED SPACER 43A82275C01	





FRONT PANEL	T1200A	T1202A
MODEL TGN6010A LESS CLOCK AND VU METER	X	
MODEL TGN6004A INCLUDES CLOCK AND VU METER		X

DIAGRAM NO. 63C862182

NOTES:
1. REFER TO SCHEMATIC DIAGRAM, 63E862181, FOR DETAIL VIEW OF TB1 AND TB2.
2. CLOCK AND VU METER ARE PART OF MODEL T1202A ONLY.
3. JUMPER NUMBERS ARE REFERENCED FROM TLN6017A AMPLIFIER AND POWER SUPPLY CHASSIS SCHEMATIC DIAGRAM 63E862181.

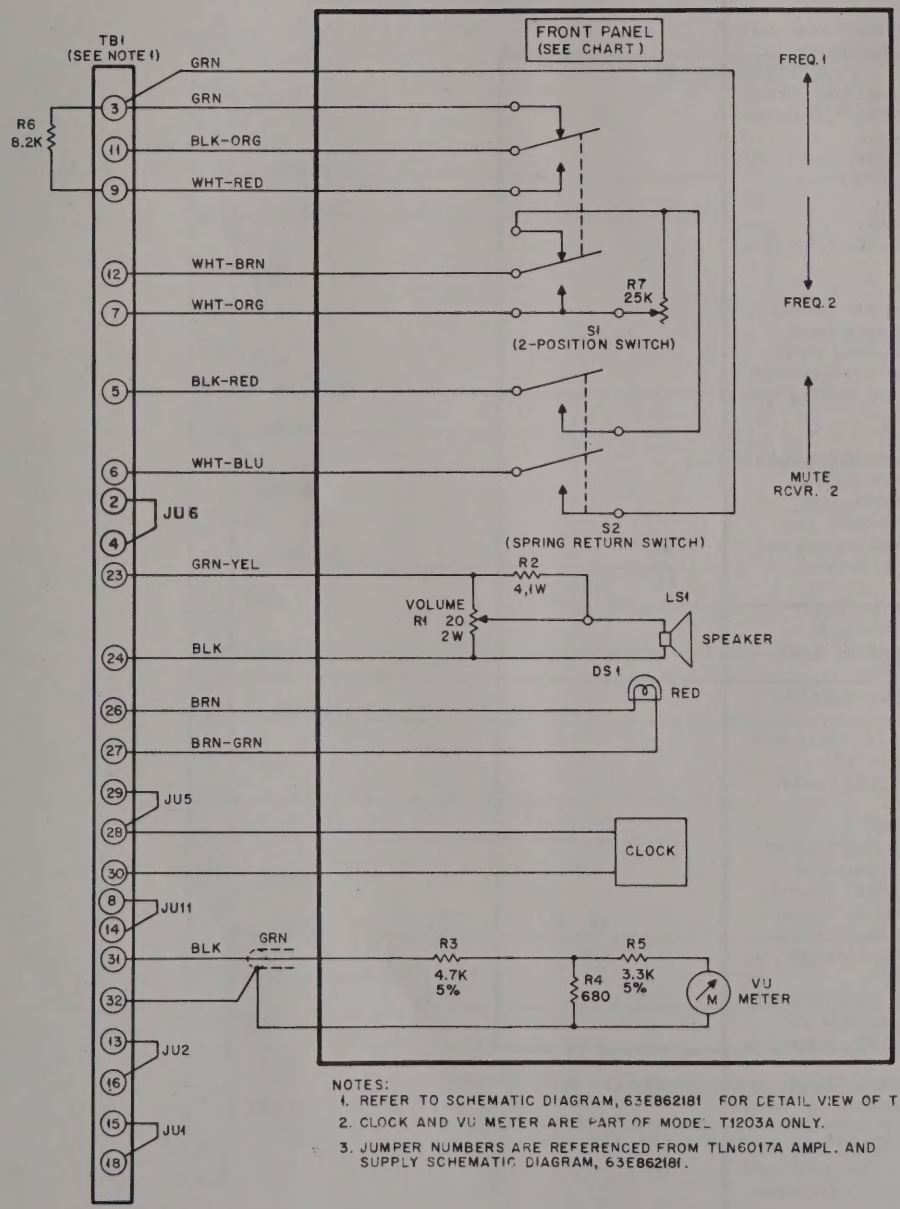
Models T1200A and T1202A
Remote Control Consoles
Intercabling Diagram
Motorola No. 63C862182-A
5/25/61-CP

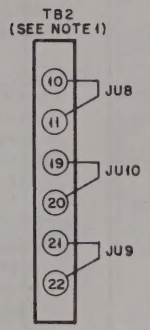
PARTS LIST for Intercabling Diagram 63C862182-A

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		LAMP, incandescent:
DS1	65R10867	6.3 volts; .25 ampere; 1/2 watt; single contact bayonet base; tabular glass; type #44
		SPEAKER, magnetic:
LS1	50C844383 or 50C852027	3.2 ohm impedance; 5"
		RESISTOR, fixed: carbon; unless otherwise stated
R1	18K838263	variable; wire wound; 20 ohm ±20%; 2 w; ins.
R2	17C82177B03 or17A82620B01	4 ±10%; 5 w 4 ±10%; 3 w
R3	6R3924	4.7K ±5%; 1/2 w; ins. used only in TGN6004A P/O Model T1202A
R4	6R5651	680 ohms ±5%; 1/2 w; ins. used only in TGN6004A P/O Model T1202A
R5	6R2003	3.3K ±5%; 1/2 w; ins. used only in TGN6004A P/O Model T1202A
		LAMPHOLDER:
XDS1	60A20781	miniature; bayonet base; single contact; does not include 41A472538 SPRING and 43A472539 BUSHING, contactor: insulated; spring and bushing must be ordered separately
		MISCELLANEOUS NON-REFERENCED PARTS LIST
	1V863819	METER AND CLOCK ASSEMBLY: consists of: 7B861047 BRACKET, clock mtg. 72C850956 METER, VU 7B82274C01 BRACKET, meter mtg: 2 req'd 43A82275C01 SPACER 1V861044 CLOCK AND LEADS ASSEMBLY: consists of: 72K861046 CLOCK, electric 30K865857 CABLE, 2 conductor: 13" length required 29K840421 LUG, terminal: 2 required 1V863820 METER MULTIPLIER ASSEMBLY: Consists of: 84B850999 PANEL, plated circuit 30K824274 CABLE, single conductor: shielded; 14" length required Reference Parts R3, R4, R5 NOTE: 1V863819 Assembly used only in TGN6004A P/O Model T1202A
	61B850891	LENS, indicator: RED

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1		JU6	JUMPER JU6 AND TERMINALS 2 AND 4 ADDED.	TB1
A	TGN6005A	R2	WAS 17K892469	PARTS LIST
			METER BRKT. WAS 7B850900	
			CLOCK CABLE WAS 30A76858	
			ADDED SPACER 43A82275C01	





FRONT PANEL	T1201A	T1203A
MODEL TGN6011A LESS CLOCK AND VU METER	X	
MODEL TGN6005A INCLUDES CLOCK AND VU METER		X

DIAGRAM NO. 63C862183

NOTES:
1. REFER TO SCHEMATIC DIAGRAM, 63E862181 FOR DETAIL VIEW OF TB1 AND TB2.
2. CLOCK AND VU METER ARE PART OF MODEL T1203A ONLY.
3. JUMPER NUMBERS ARE REFERENCED FROM TLN6017A AMPL. AND SUPPLY SCHEMATIC DIAGRAM, 63E862181.

Models T1201A and T1203A
Remote Control Consoles
Intercabling Diagram
Motorola No. 63C862183-A
5/25/61-CP

PARTS LIST for Intercabling Diagram 63C862183-A

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		LAMP, incandescent:
DS1	65R10867	6.3 volt; .25 ampere; 1/2 watt; single contact bayonet base; tubular glass; type #44
		SPEAKER, magnetic:
LS1	50C844383 or 50C852027	3.2 ohm impedance; 5"
		RESISTOR, fixed: carbon; unless otherwise stated
R1	18K838263	variable; wire wound; 20 ohm ±20%; 2 w; ins.
R2	17C82177B03 or 17A82620B01	4 ±10%; 5 w 4 ±10%; 3 w
R3	6R3924	4.7K ±5%; 1/2 w; ins.; used only in TGN6005A P/O Model T1203A
R4	6R5651	680 ohm ±5%; 1/2 w; ins.; used only in TGN6005A P/O Model T1203A
R5	6R2003	3.3K ±5%; 1/2 w; ins.; used only in TGN6005A P/O Model T1203A
R6	6R5610	8.2K ±10%; 1 w; ins.
R7	18K483726	variable; 25K +40-0%; 1/4 w; ins.
		SWITCH, lever:
S1	40B855063	1 position; dual stack; contact arrangement, each stack, 1 Form "C"; locking type
S2	40B855061	1 position; contact arrangement, 2 Form "A"; non-locking type
		LAMPHOLDER:
XDS1	60A20781	miniature; bayonet base; single contact; does not include 41A472538 SPRING and 43A472539 BUSHING, contactor; insulated; spring and bushing must be ordered separately

MISCELLANEOUS NON-REFERENCED PARTS LIST

	1V863819	METER AND CLOCK ASSEMBLY: consists of: 7B861047 BRACKET, clock mtg. 72C850956 METER, VU 7B82274C01 BRACKET, meter mtg: 2 req'd 43A82275C01 SPACER 1V861044 CLOCK AND LEADS ASSEMBLY: consists of: 72K861046 CLOCK, electric 30K865857 CABLE, 2 conductor: 13" length req'd. 29K840421 LUG, terminal, 2 req'd. 1V863820 METER MULTIPLIER ASSEMBLY: consists of: 84B850999 PANEL, plated circuit 30K824274 CABLE, single conductor: shielded; 14" length required Reference Parts R3, R4, R5 NOTE: Assembly 1V863819 used only in TGN6005A P/O Model T1203A
	61B850891	LENS, indicator: RED

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1	TGN6006A	S1	SWITCH CONTACTS REVISED	FRONT PANEL
O2		JU6	JUMPER JU6 AND TERMINALS 2 AND 4 ADDED TO TB1	TB1
		JU12	WAS JU11	TB1
A	TGN6006A	R2	WAS 17K892469	PARTS LIST
			METER BRKT. WAS 7B850900	
			CLOCK CABLE WAS 30A76858	
			ADDED SPACER 43A82275C01	

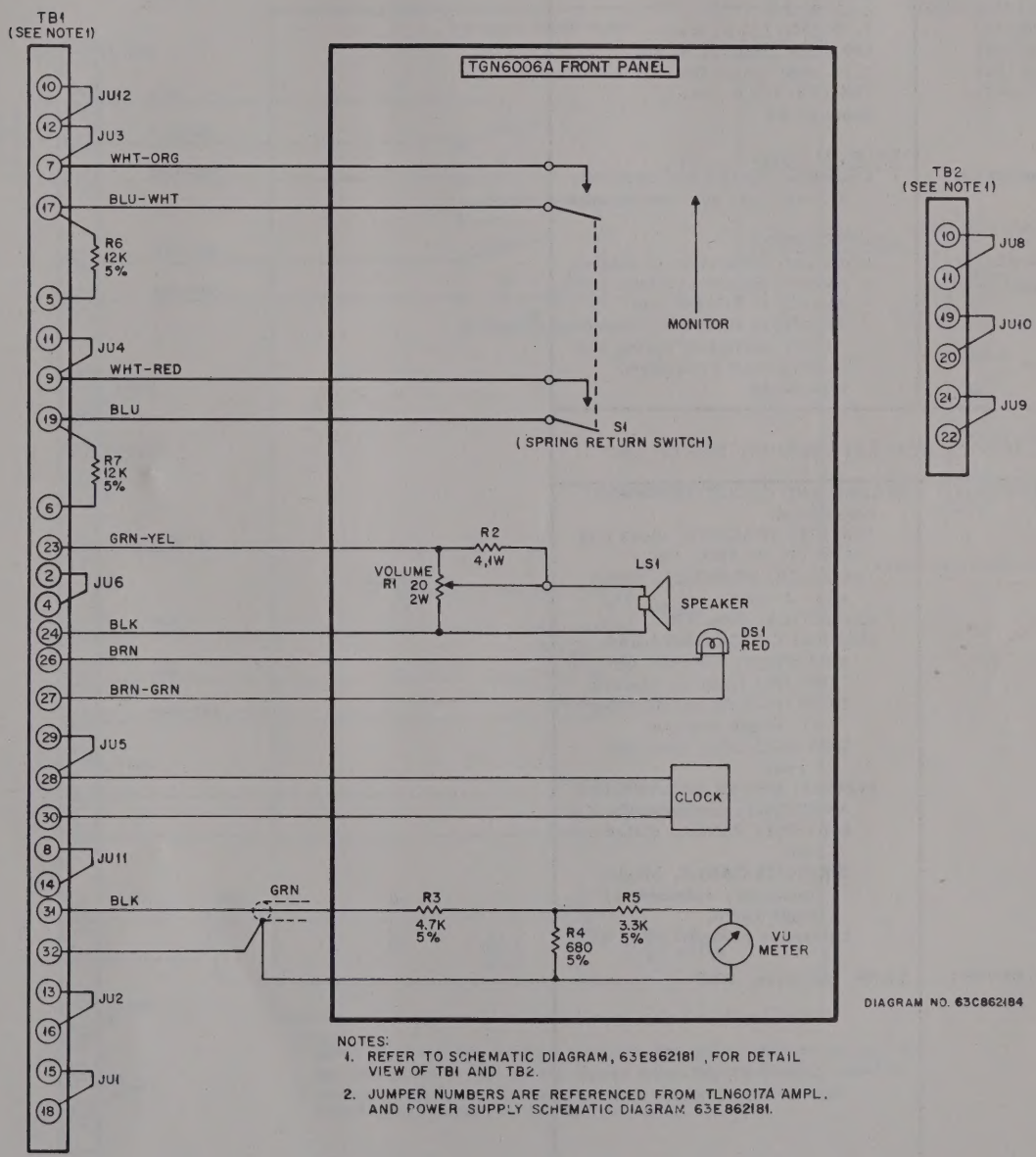


DIAGRAM NO. 63C862184

NOTES:
1. REFER TO SCHEMATIC DIAGRAM, 63E862181 , FOR DETAIL VIEW OF TB1 AND TB2.
2. JUMPER NUMBERS ARE REFERENCED FROM TLN6017A AMPL. AND POWER SUPPLY SCHEMATIC DIAGRAM 63E862181.

Model T1204A
Remote Control Console
Intercabling Diagram
Motorola No. 63C862184-A
5/25/61-CP

PARTS LIST for Intercabling Diagram 63C862184-A

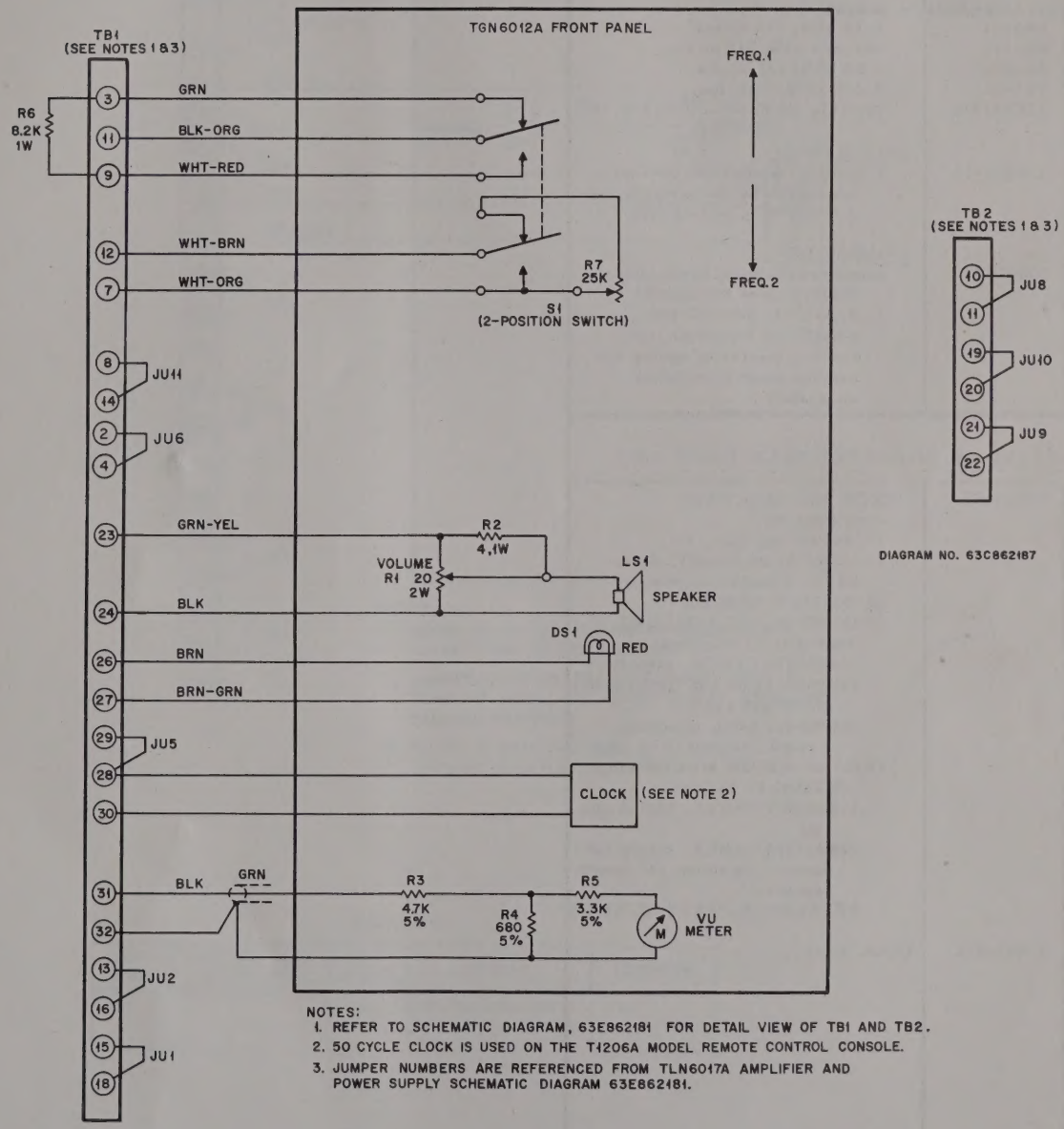
REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		LAMPS, incandescent:
DS1	65R10867	6.3 volt; .25 ampere; 1/2 watt; single contact bayonet base; tubular glass; type #44
		SPEAKER, magnetic:
LS1	50C844383 or 50C852027	3.2 ohm impedance; 5"
		RESISTOR, fixed: carbon; unless otherwise stated
R1	18K838263	variable; wire wound; 20 ohms ±20%; 2 w; ins.
R2	17C82177B03 or17A82620B01	4 ±10%; 5 w 4 ±10%; 3 w
R3	6R3924	4.7K ±5%; 1/2 w; ins.
R4	6R5651	680 ohms ±5%; 1/2 w; ins.
R5	6R2003	3.3K ±5%; 1/2 w; ins.
R6	6R2075	12K ±5%; 1/2 w; ins.
R7		same as R6
		SWITCH, lever:
S1	40B855061	1 position; contact arrangement, 2 Form "A"; non-locking type
		LAMPHOLDER:
XDS1	60A20781	miniature; bayonet base; single contact; does not include 41A472538 SPRING and 43A472539 BUSHING, contactor: insulated; spring and bushing must be ordered separately

MISCELLANEOUS NON-REFERENCED PARTS LIST

	1V863819	METER AND CLOCK ASSEMBLY: consists of: 7B861047 BRACKET, clock mtg. 72C850956 METER, VU 7B82274C01 BRACKET, meter mtg: 2 req'd 43A82275C01 SPACER 1V861044 CLOCK AND LEAD ASSEMBLY: consists of: 72K861046 CLOCK, electric 30K865857 CABLE, 2 conductor: 13" length required 29K840421 LUG, terminal 2 reqd. 1V863820 METER MULTIPLIER ASSEMBLY: consists of: 84B850999 PANEL, plated circuit 30K824274 CABLE, single conductor: shielded; 14" length req'd. Reference parts R3, R4, R5
	61B850891	LENS, indicator: RED

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1		JU6	JUMPER JU6 AND TERMINALS 2 AND 4 ADDED.	TB1
A	TGN6012A	R2	WAS 17K892469	PARTS LIST
			METER BRKT. WAS 7B850900	
			CLOCK CABLE WAS 30A76858	
			ADDED SPACER 43A82275C01	



NOTES:
1. REFER TO SCHEMATIC DIAGRAM, 63E862181 FOR DETAIL VIEW OF TB1 AND TB2.
2. 50 CYCLE CLOCK IS USED ON THE T1206A MODEL REMOTE CONTROL CONSOLE.
3. JUMPER NUMBERS ARE REFERENCED FROM TLN6017A AMPLIFIER AND POWER SUPPLY SCHEMATIC DIAGRAM 63E862181.

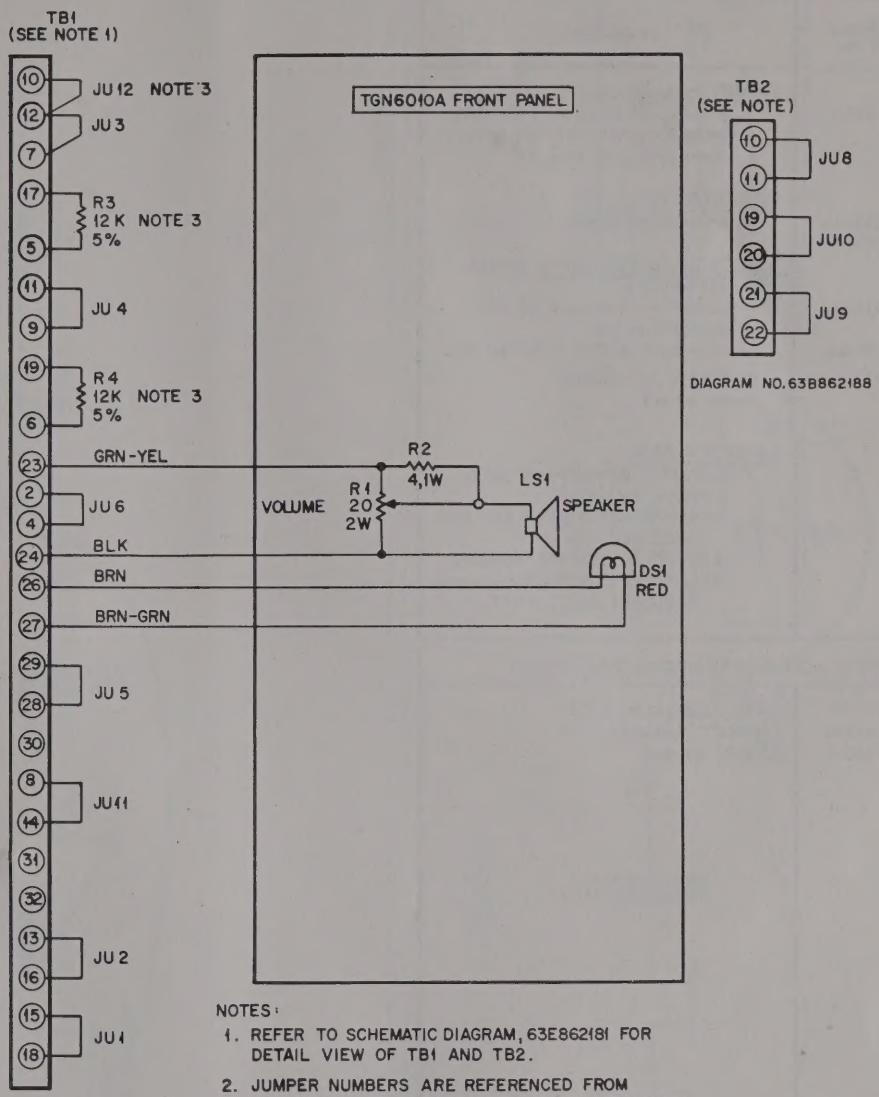
Model T1206A
Remote Control Console
Intercabling Diagram
Motorola No. 63C862187-A
5/25/61-CP

PARTS LIST for Intercabling Diagram 63C862187-A

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		LAMP, incandescent:
DS1	65R10867	6.3 volt; .25 ampere; 1/2 watt; single contact bayonet base; tubular glass; type #44
		SPEAKER, magnetic:
LS1	50C844383 or 50C852027	3.2 ohm impedance; 5"
		RESISTOR, fixed: carbon; unless otherwise stated
R1	18K838263	variable; wire wound; 20 ohm ±20%; 2 w; ins.
R2	17C82177B03 or17A82620B01	4 ±10%; 5 w 4 ±10%; 3 w
R3	6R3924	4.7K ±5%; 1/2 w; ins.
R4	6R5651	680 ohm ±5%; 1/2 w; ins.
R5	6R2003	3.3K ±5%; 1/2 w; ins.
R6	6R5610	8.2 K ±10%; 1 w; ins.
R7	18K483726	variable; 25 K +40-0%; 1/4 w; ins.
		SWITCH, lever:
S1	40K855063	1 position; dual stack; contact arrangement, each stack, 1 Form "C"; locking type
		LAMPHOLDER:
XDS1	60A20781	miniature; bayonet base; single contact; does not include 41A472538 SPRING and 43A472539 BUSHING, contactor: insulated; spring and bushing must be ordered separately

MISCELLANEOUS NON-REFERENCED PARTS LIST

	1V864405	METER AND CLOCK KIT: consisting of: 72C850956 METER, VU 7B82274C01 BRACKET, meter mtg.: 2 req'd 43A82275C01 SPACER 1V864406 CLOCK AND LEAD ASSEMBLY: includes: 72K863996 CLOCK, electric 30K865857 CABLE, 2 conductor: 13" length req'd. 29K840421 LUG, terminal: 2 req'd. 1V863820 METER MULTIPLIER ASSEMBLY: includes: 84B850999 PANEL, plated circuit 30K824274 CABLE, single conductor: shielded; 14" length required REFERENCE PARTS R3, R4, R5
	61B850891	LENS, RED



NOTES:

1. REFER TO SCHEMATIC DIAGRAM, 63E862181 FOR DETAIL VIEW OF TB1 AND TB2.
2. JUMPER NUMBERS ARE REFERENCED FROM TLN6017A AMPL. AND POWER SUPPLY SCHEMATIC DIAGRAM 63E862181.
3. R3, R4 & JU12 ARE PART OF TLN6169A "PRIVATE-LINE" RESISTOR KIT.

REVISIONS

DIAG. ISSUE	CHASSIS AND SUFFIX NO.	REF. SYMBOL	CHANGE	LOCATION
O1		JU6	JUMPER JU6 AND TERMINALS 2 AND 4 ADDED.	TB1

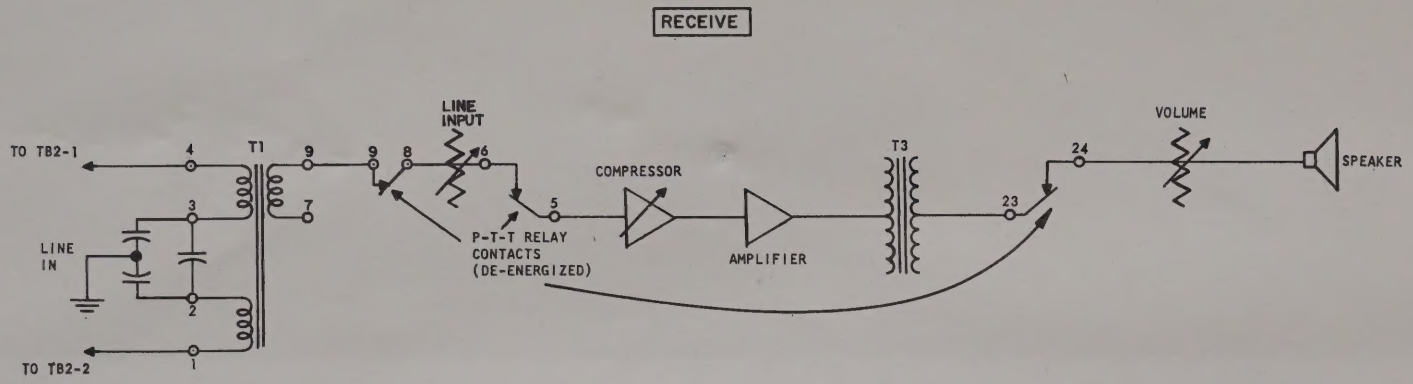
Model T1207A
Remote Control Console
Intercabling Diagram
Motorola No. 63B862188-O1
5/25/61-CP

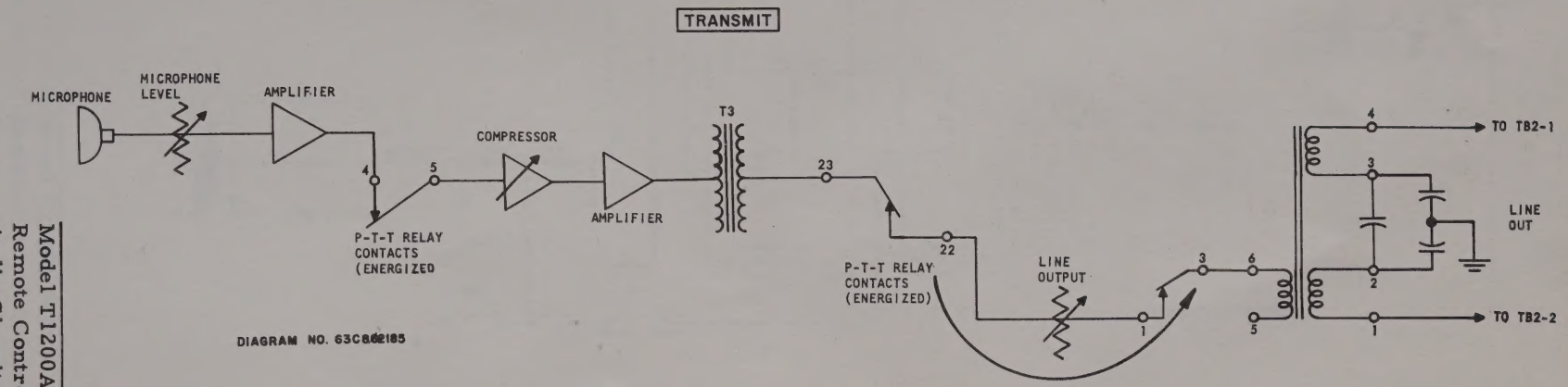
PARTS LIST For Intercabling Diagram 63B862188-O1

REFERENCE SYMBOL	MOTOROLA PART No.	DESCRIPTION
		LAMP, incandescent:
DS1	65R10867	6.3 volt; .25 ampere; 1/2 watt; single contact bayonet base; tubular glass; type #44
		SPEAKER, magnetic:
LS1	50C844383 or 50C852027	3.2 ohm impedance; 5"
		RESISTOR, fixed: carton; unless otherwise stated
R1	18K838263	variable; wire wound; 20 ohm ±20%; 2w; ins.
R2	17K892469	wire wound; 4 ohm ±2%; 1w; ins.
R3	6R2075	12K ±5%; 1/2 w; ins.
R4		same as R3
		LAMPHOLDER:
XDS1		miniature; bayonet base; single contact; includes 60A20781 SOCKET, light: and insulated clip 41A472538 SPRING, backing 43A472539 BUSHING, contactor, insulator and

MISCELLANEOUS NON-REFERENCED PARTS LIST

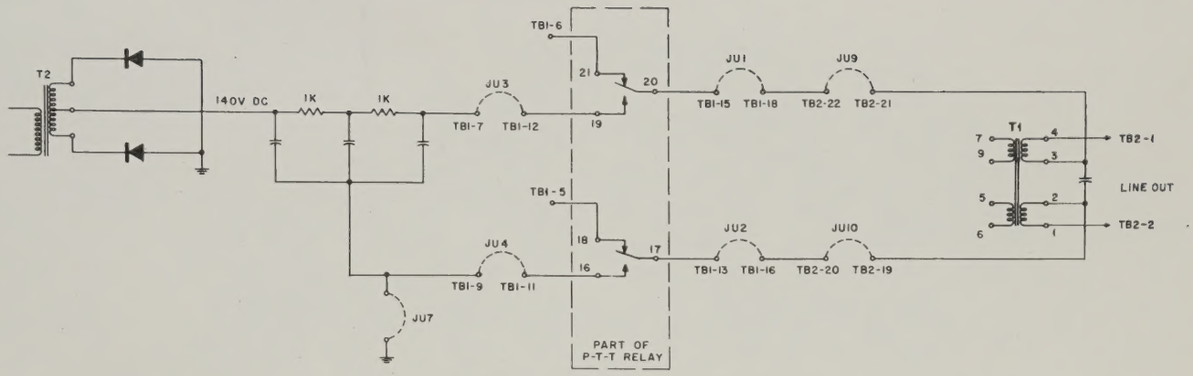
	61B850891	LENS, indicator: RED
	32B844382	GASKET, speaker
	36B844653	KNOB, control


RECEIVE
TO TB2-1
4
T1
9
9
8
LINE INPUT
6
COMPRESSOR
T3
24
VOLUME
SPEAKER
3
7
5
23
LINE IN
P-T-T RELAY CONTACTS (DE-ENERGIZED)
AMPLIFIER
2
TO TB2-2
1

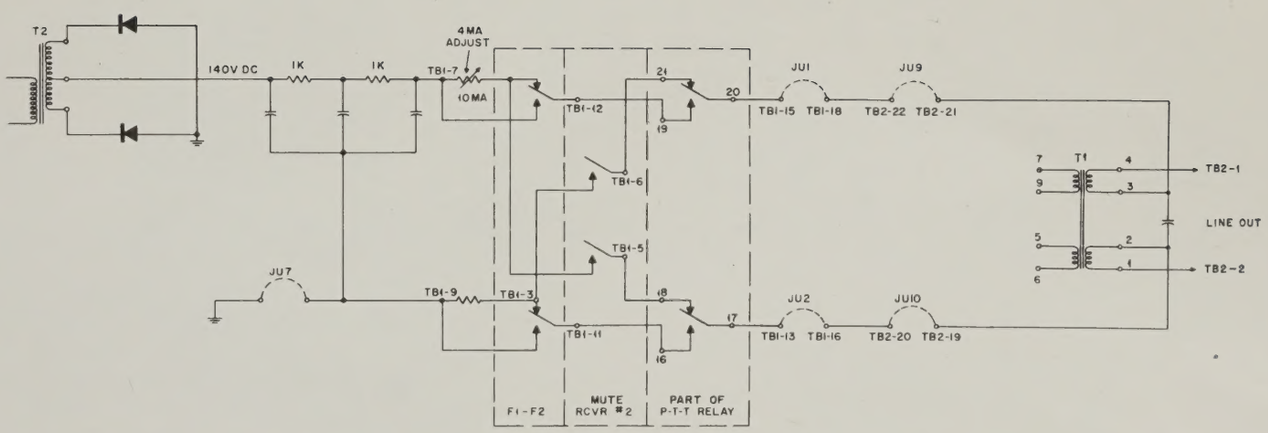

TRANSMIT
MICROPHONE
MICROPHONE LEVEL
AMPLIFIER
4
5
COMPRESSOR
T3
23
4
TO TB2-1
3
LINE OUT
P-T-T RELAY CONTACTS (ENERGIZED
AMPLIFIER
22
P-T-T RELAY CONTACTS (ENERGIZED)
LINE OUTPUT
3
6
2
5
1
1
TO TB2-2
DIAGRAM NO. 63C862185

"PRIVATE-LINE" DISABLE MODEL

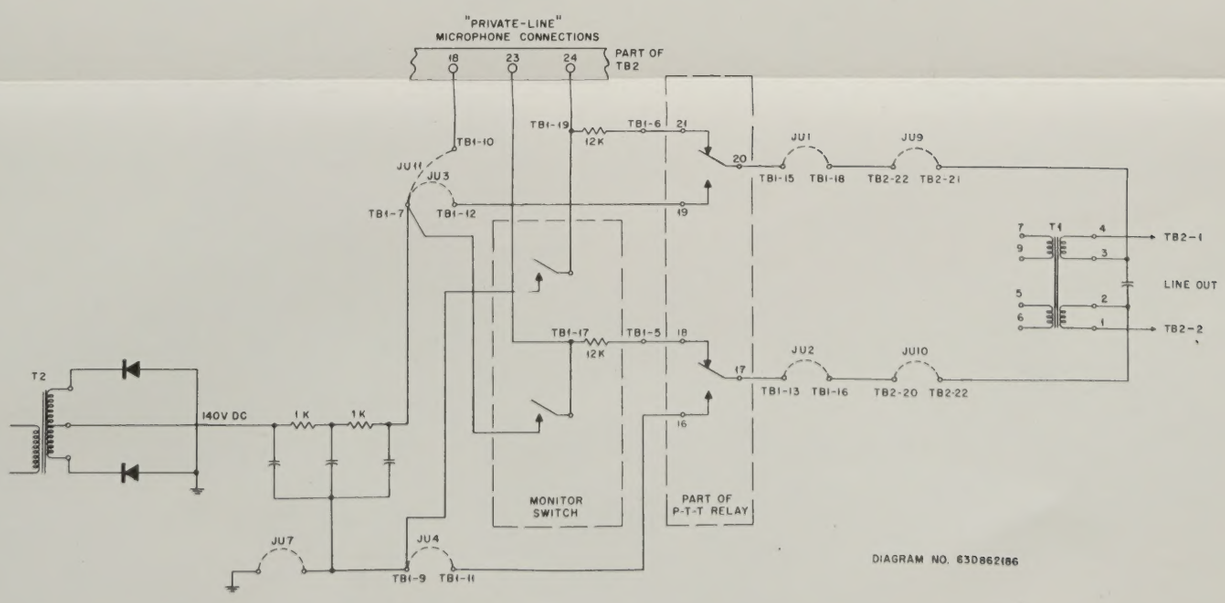
Model T1200A Series
Remote Control Consoles
Control Circuit Diagram
Motorola No. 63D862186-O



SINGLE FREQUENCY CONTROL MODELS



TWO FREQUENCY CONTROL MODELS



"PRIVATE-LINE" DISABLE MODEL